Engineering Library

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ENGINEERING NEWS *and* ENGINEERING RECORD CONSOLIDATE

Engineering News and Engineering Record will be consolidated April 5 as the Engineering News-Record.

We find it hard in making this announcement to refrain from the use of superlatives. Both papers have had such remarkable careers, both have built up such strong clienteles, both have to their credit so many achievements that the imagination is fired at the thought of what they are capable of doing when their prestige, their staffs, their energies are combined.

For years both have been developing rapidly, and as they developed their conceptions of the journalistic needs of the civil engineer and the contractor have come closer together and are now practically identical. Consequently, there has been much duplication—in material published and in the organization to produce the papers. Moreover, each paper has excelled in certain special fields, due to the abilities of the specialists on the respective staffs.

Now it is proposed to give the readers under one cover the strong features of both papers and to turn the duplicated effort into productive lines. Mr. Charles Whiting Baker, for 21 years editor of Engineering News, will be editor-in-chief, while Mr. E. J. Mehren, editor of the Engineering Record, will become vice-president and general manager of the McGraw-Hill Publishing Co., Inc., which will be formed to take over the combined paper, as well as all the other interests of the McGraw Publishing Company, Inc., and of the Hill Publishing Company, including ten technical journals.

We bespeak for the new journal the same hearty support that has been accorded to the two constituent papers and on behalf of the editors we pledge a service to the civil engineer and the contractor entirely unprecedented in technical journalism. And we give this pledge with the greater confidence, because our publishing experience tells us that never before has there been put together so able and brilliant a staff as that which will man the new journal.

JAMES H. McGRAW,
President, McGraw Publishing Company, Inc.

ARTHUR J. BALDWIN,
President, Hill Publishing Company

Cover released by courtesy of UNIVERSAL DRAFTING MACHINE COMPANY, CLEVELAND, OHIO.

Here's Where the Reliability of Lackawanna Steel Sheet Piling Kept the Contractor Out of Real Trouble

The building of the new Susquehanna River Bridge of the P. & R. Railroad at Milton, Pa., required 12 cofferdams of Lackawanna Steel Sheet Piling for pier foundation work.

After the walls of Cofferdam No. 2 (shown herewith) had been driven a few feet through silt and sand under the river, part of the sheet piling refused to penetrate further. Old residents stated that a former bridge at this location had washed away at the time of the Johnstown flood and that the stone piers which carried it had been upset and lay unbroken in the river. This proved to be true. When No. 2 cofferdam was unwatered and excavated, one of these old piers 6 feet thick, was uncovered and found to spread over two-thirds of the base area of the cofferdam. As indicated by the pile of spoil shown herewith, the part in the cofferdam was removed and excavation continued to bed rock. No difficulty was encountered from leakage, a No. 3 Emerson Pump keeping the excavation dry.

Under these extraordinary conditions, the Lackawanna Steel Sheet Piling not only did everything that could be desired, but upon being pulled was driven again in *four more successive installations*, each through 8 feet of sand, gravel and hard boulders.

The foundation work here was done by Robt. Grace Contracting Co., under direction of F. P. Kemon, Superintendent.

The unfailing reliability of Lackawanna Sheet Piling, together with the free cooperation of our engineers, offer a protection and economy that on certain classes of foundation work are otherwise unobtainable.

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Clamshell Dredge with 195-Ft. Boom

The clamshell dredges used extensively for levee work on California rivers have been notable for their long booms, which are necessary for building the levee at a sufficient distance from the deep-water channel. Lengths of 120 to 125 ft. were in use more than 10 yr. ago. A dredge with 175-ft. boom was built in 1907 by the Risdon Iron Works, of San Francisco. It handled a 5-yd. bucket and could lift a weight of 18 tons at 175-ft. reach. Its hull was of timber construction, 130x61½ ft., with a depth of 12 ft. This machine was burned in 1914, but the available parts of the equipment were utilized in the new and larger dredge described below. This was built by the Union Works Co., of San Francisco, Calif., and information has been furnished by George L. Hurst, Manager of the Dredging Department.

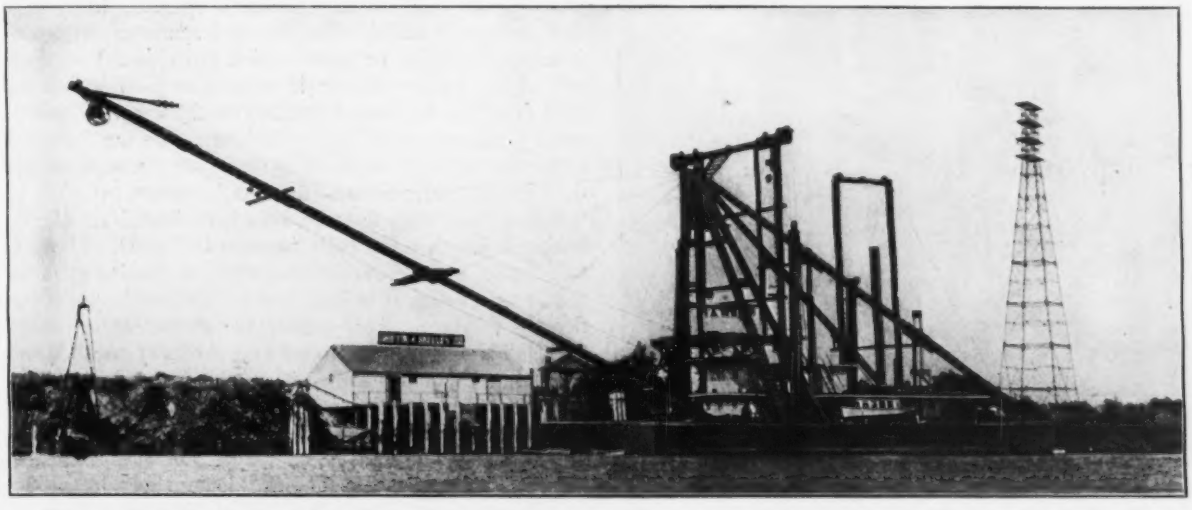


FIG. 1. CLAMSHELL DREDGE FOR BUILDING LEVEES ALONG CALIFORNIA RIVERS, WITH A 5-YD. BUCKET ON A 195-FT. BOOM

The hull has steel trusses and side plating, with bottom and deck of timber. It is 140 ft. long and 61 ft. 4 in. wide, with a depth of 13 ft. at the sides and 13½ ft. at the center. The side plating is ⅝ in. thick, made in two courses. The plates were made as long as possible, some being 50 ft. in length. Where the side plating is attached to the bottom of the hull, it is reinforced with an angle 8x8x⅝ in. bolted to a 12x18-in. timber. This angle extends the full length of the hull. The upper edge of the side plating is reinforced with an 18-in. angle plate, knuckled down 6 in. The vertical side frames are 12-in. 20-lb. channels, spaced 3 ft. c. to c. The transverse frames are of 12x12-in. timbers, connected to the vertical frames by ⅜-in. gusset plates.

The hull has two main longitudinal trusses extending its entire length and a center longitudinal truss about 60 ft. long. Connecting these are three transverse trusses, two immediately below the A-frame and one about two-thirds of the way aft, or just in front of the boiler. The longitudinal trusses are of 12-in. 20½-lb. channels and 10-in. Bethlehem H-beams. The cross-trusses have 12-in. channels for the bottom members and 10-in. channels for the top members, the diagonal members being 6-in. Bethlehem H-beams. Considerable trouble was experienced in so designing and placing the trusses that they would not interfere with the machinery, since the winding gear, engines, etc., are all below deck. The living accommodations, operating house, owner's quarters, etc., are above deck and are worked in between the members of the A-frame.

The A-frame consists of three legs on each side, all terminating in one point that supports a cast-steel cap. This in turn takes the topping-lift, which supports the outer end of the boom. The forward legs are 20x20-in. timbers 76 ft. long, in one piece for each side, and the cap is 68 ft. above the deck. The back legs are made out of 12x16-in. timbers in two pieces. All the legs rest in cast-iron sole plates on the deck. Immediately behind or aft of the A-frame is the gallows frame for lifting the spuds. This is made of 18x18-in. timbers, 78 ft. long, and extends down to the bottom of the hull. To take up the tension strains on the A-frame there is a system of 3-in. rods with turnbuckles. These connect to heavy chain-plates fastened to the side plating.

The boom is made up of three lengths, the outer section being 20x22 in. and the other two sections 22x22 in. The total length of the boom is 195 ft. It is trussed

vertically and laterally, long timber spreaders carrying the side truss-rods. To take care of the list of the dredge, which takes place when the boom swings at 90° from the center line, the A-frame cap is 5½ ft. forward of the pivot point of the lower end of the boom, known as the heel casting.

When the boom is swung at right angles, the dredge will have considerable list; and this offset permits the boom to swing around on practically a level plane. In fact, the builders state that a well-balanced dredge should be so arranged that when the bucket is dumped the dredge will right itself sufficiently so that the boom will swing back of its own accord. The swinging of the boom is taken care of automatically by means of two bucket lines, the closing line being the right-hand line and the dumping line the left-hand line. The point where these lines connect with the A-frame in this dredge is 18 ft. from each side of the center of the dredge, or in other words, the leverage on an arm 195 ft. long is only 18 ft.

For rapid working the dredge must be carefully balanced. The operator drops the bucket and proceeds to hoist on the closing line; this puts a strain on the right-

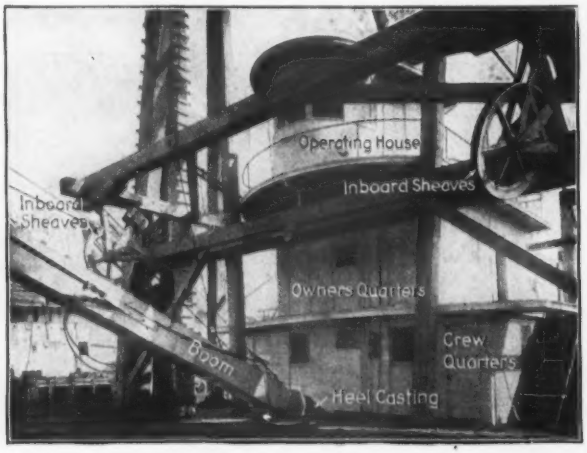


FIG. 2. OPERATING END OF CLAMSHELL DREDGE

hand line, and the bucket begins to come up. At the same time the boom commences to swing around. When the desired point is reached, the operator lets go on the hoisting-line friction and the weight of the bucket falls on the opening line, which immediately opens and puts the strain on the opposite side of the boom. The boom then swings back to position, and the bucket is dropped for another load.

The dredge has tandem cross-compound horizontal condensing engines, with cylinders 14x24 and 22x24 in., running at a maximum speed of 150 r.p.m. As the engines must be about 40 ft. apart, it is necessary to control the supply of steam by means of throttling valves placed immediately above the high-pressure cylinders. There is no flywheel, and the crank pins are set at 90°. There are two pinions on the crankshaft, which gear into the main drum gears, these gears being 10 in. in diameter, 10-in. face and 3-in. pitch. The gears have a flat surface about 8 in. wide on one side, on which are bolted V-shaped friction blocks. Various kinds of wood and fiber have been tried out, but sugar or bull pine is considered the best. As these friction blocks wear down, 2-in. pieces are put behind them and bolted up so that there is very little loss.

The friction races are V-shaped and bolted to the main reels or drums, which are 3 ft. 4 in. in diameter, with turned grooves for 1⅜-in. wire rope. Gears, friction races and drums are all of cast iron, the drums having bronze bushings. The friction races are forced on the friction blocks by means of a center pin and cross-cotter of the usual design, the pivot pin with a hardened-steel disk (all working in a bath of oil) being part of the outer bearing on the 7¾-in. drumshaft. This shaft is of forged steel.

The goose-neck lever that operates the center pin has a leverage of about 25 to 1, and the reach rod extends from the outer end of this lever to just outside the operating house. The operating lever proper consists of two pieces of 4x6-in. timber about 12 ft. long, placed horizontally, the ends being round and placed just high enough for the leverman to rest his elbows on them. The throttle lever is placed vertically between them and in front of the operator.

The dredge is held in position when at work by means of three spuds, two forward and one at the stern. The stern spud is known as a fleeting spud and is held in a steel frame, or carriage, which permits it to slide on the outside of the dredge. Thus when the point of the spud is held in the mud and the carriage is operated, the dredge will be pushed ahead. The forward spuds fit into cast-iron spud casings, or wells, which are situated on each side of the dredge as near the outside as possible and extend from the bottom of the hull to the deck. The forward spuds are 30x30 in., 70 ft. long. The fleeting spud is 24x24 in., 60 ft. long. The spuds are operated by the deck hands, under signals from the leverman.

When the dredge is to be moved, or fleeted ahead, the bucket is dropped and both lines are tightened. The forward spuds are then raised, and with the fleeting spud on the bottom, steam is turned into the 15-in. cylinder of the fleeting carriage. This pushes the dredge ahead about 12 ft. The steam is controlled by a threeway cock. When the dredge is in its new position, the forward spuds are dropped. The fleeting spud is raised, and its carriage is moved ahead ready for the next fleet, or move. All spuds are raised by a double-cylinder 10x12-in. horizontal engine, which drives a 6-in. cross-drum shaft by means of a herringbone gear and pinion, with a gear ratio of about 8 to 1.

Water-Works Service Connections*

For water-works services smaller than 3 in. five different kinds of material are in use throughout the country—plain iron, galvanized iron, lead, lead lined and cement lined. Galvanized iron and lead are commonly used in this territory. In making a choise the determining factor would be that the material to be used should be that which represents the lowest cost during the life of the service, taking into consideration original cost, interest on the investment and cost of upkeep. The elements of cost are common labor for excavating; skilled labor to make up the service connections; brass parts for controlling the supply at the main and near the curb, and the service pipe with stop or valve boxes; cost of delivering the material; supervision and accounting.

*Abstract of a paper read before the Minnesota Surveyors and Engineers Society by Garrett O. House, Superintendent of Water-Works, St. Paul, Minn., February, 1917.

In New England cities it is found as an average experience that galvanized iron will probably begin to give trouble after 15 yr. service and its life may be considered as 20 yr.; that lead pipe begins to give trouble in 10 yr. and that its life is 35 yr. In St. Paul experience shows that galvanized pipe begins to give trouble in 10 yr. or less and that its reasonable life under average conditions will not exceed 17½ yr., while lead service pipe, under ordinary conditions, has a life of 35 yr. and the time when trouble begins is very indefinite, as its trouble is due to settlement or accidental causes.

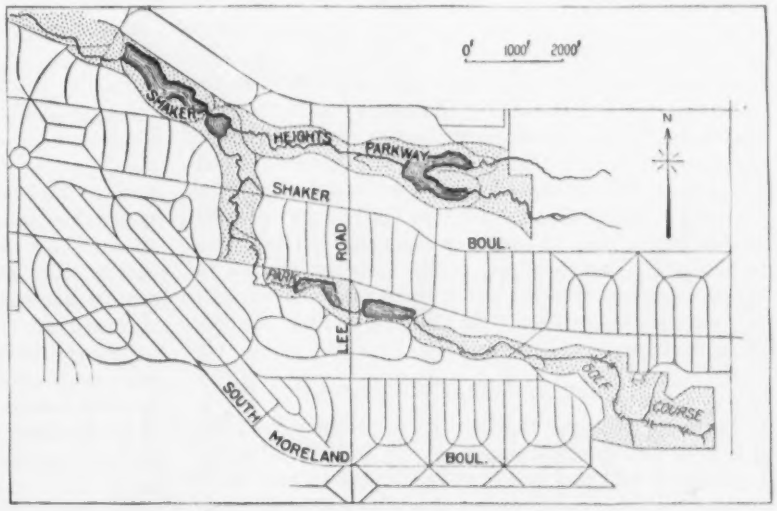
For the purpose of comparison a ¾-in. service pipe 50 ft. long is taken. This connection in lead pipe would cost $35 and in galvanized iron $25. Estimating the life of the lead pipe at 35 yr. and that of the galvanized-iron pipe at one-half that time, the depreciation on the lead pipe would be $1 per yr. and on galvanized-iron pipe $1.43 per yr. The interest on the lead service pipe would average 90c. per yr. through its life, and the interest on the investment on galvanized-iron pipe service would average 66c. throughout its life, or a total cost per year for lead-pipe service of $1.90 and for galvanized-iron pipe service of $2.09 per yr. It is the experience of those who have installed and maintained lead and galvanized-iron pipe services that, when galvanized-iron pipe becomes defective, the recurrence of leaks is frequent and expensive repairs are required until the time for replacement arrives. In the case of lead pipe, repairs on account of natural deterioration seldom have to be made for the first 20 yr., and we have found lead service pipe in perfect condition after 25 yr. The rules of the St. Paul Bureau of Water provide that the bureau furnish all materials and do all the work of installing service pipes from the water main to the property line, and the cost of this labor and material is paid by the property owner. The Water Department also makes all repairs to the water-service connections at the expense of the owner, the actual cost being charged therefor. As the owner of the premises is not permitted by the Department of Public Works to make any excavation in the street and is not permitted by the Bureau of Water to make any repairs to the water connections, and as the Bureau of Water makes the original installation, the owner has very little to say about it. Therefore, he should not be held responsible for other than natural deterioration of the service pipes, which should be guaranteed to him for a reasonable life; and the cost of maintenance and repairs should be at the expense of the Bureau of Water. The repairs usually necessary to water-service connections are due to imperfect workmanship or material, or to settlements, freezing or electrolysis, for none of which can the owner be held responsible.

Frozen water connections are one of the sources of anxiety both to the water department and to the citizen in this climate. The St. Paul Water Department uses a gas-engine electric generator set on a motor-truck trailer for thawing out water service (see *Engineering News*, Mar. 16, 1916). The records show that most services are relieved of ice within 2 min., and some of the more serious freezings have not required over 15 min. An arbitrary charge of $5 per service is made for the use of this thawing machine.

Some Original City Planning

The accompanying sketch shows some original ideas put into practice in laying out the streets of a suburban real-estate development near Cleveland, Ohio, known as Shaker Heights. The tract originally belonged to a colony of Shakers, which by 1889 had dwindled to two persons. They sold the property to a syndicate, which was responsible for the layout of some parts of the tract. The area labeled Shaker Heights Parkway was at that time given to the City of Cleveland for a public park.

Development of the tract proceeded slowly until 1906, when O. P. and M. J. Van Sweringen bought an interest in the syndicate. The new owners are responsible for a rearrangement of the street system, in which the governing features were topography and provision for rapid-transit service. The Van Sweringens are also the owners of the rapid-transit system (the Cleveland & Youngstown Ry.) that is being developed to serve this district, and it seems that the street layout, as will appear from an analysis, is designed for, and apparently well meets, the convenience of the railway operation. The object of the converging cross-streets on Shaker Boulevard and South Moreland Boulevard and the almost entire elimination of short blocks on these transit lines is to concentrate passengers at infrequent car stops. For example, the peculiar street layout on South Moreland Boulevard from Lee Road east makes necessary only one stop for five cross-streets, or one stop in 1,250 ft.



SKETCH PLAN OF SHAKER HEIGHTS VILLAGE, CLEVELAND, OHIO

The oval-shaped areas in the center of the tract are designedly inaccessible, for these are for the aristocratic element who have no need of street-car transportation.

B. L. Jenks, of Cleveland, attorney for the Van Sweringen interests, has been connected with the development of the project for several years. No architect or engineer is responsible for the general scheme or plan. The surveying and engineering work was done by the F. A. Pease Engineering Co., Cleveland.

Finding the Economical Suction Lift of a Centrifugal Pump

By Otto Haentjens*

What is the maximum suction lift that a centrifugal pump will efficiently carry? What is the suction lift for greatest efficiency? These are questions that have bothered designers for years. Failure to consider them has often given a pump a reputation of being poorly designed, where it has not worked as well as another one on the same lift. Most manufacturers state in their catalogs or rating tables that the suction should be kept as low as possible and should not exceed 15 ft., as for higher lifts a drop in capacity and efficiency is likely to occur. This is true in some cases, but the reverse has been observed in other instances up to a certain point. The author, in solving this problem, has developed certain "vacuum curves" that enable a designer to select the proper pump and impeller for any lift, and give the operating engineer a better understanding of conditions that govern the suction lift of a centrifugal pump.

In the following discussion mainly centrifugal pumps of the volute type are considered. All tests referred to were made on the factory test stand with double-suction volute pumps, and the piping and gages were arranged as shown in Fig. 1. To the vacuum-gage readings is added the distance *A*; and wherever the word "vacuum" is used, it signifies the distance of the water level to the center line of the pump plus the friction head in feet of water in the suction pipe up to the vacuum gage. The friction in the pump-suction elbow, in the impeller and in the volute chamber up to the point where the discharge gage is connected, interests only the designer and not the operating engineer.

Suction-Lift Relations

Assuming that the suction line is properly laid, that it is tight and contains no air pockets, and assuming that the water is cold and free from vapors, the vacuum which a centrifugal pump can produce depends then on the shape of the pump-suction elbow, or suction head, the inlet opening of the impeller and its speed, the ratio of outside diameter to inside diameter of the impeller, and the amount of water pumped. In order fully to understand the problem it is best to investigate the characteristic curves of one impeller at different speeds. As is well known, the capacity changes in direct proportion to the speed, and the head as the square of the speed. This holds good as long as the water velocities in the impeller and casing remain within certain limits. If they exceed these limits, the capacity falls off quicker than the above-mentioned law would indicate, until finally a point is reached where a further increase in speed does not increase the capacity. This point is called the "break point"; it is seen in the curves of Fig. 2, which represent the performance of an 8-in. double-suction volute pump. The break occurs at 3,850 gal. per min.

The pump was set up as shown in Fig. 1, with about 15 ft. of 12-in. suction pipe between the elbow and the pump. The vacuum could be increased by throttling the gate valves in the suction pipe, and the long pipe served to straighten out the water before it flowed into the pump casing. The pump was first tested with the valve in the suction line wide open and the valve in the discharge line throttled for the various pressures. As the capacity increased, the vacuum naturally increased; the vacuum readings for the corresponding capacities were noted and are represented for 2,300 r.p.m. in Fig. 3 by a line called the "pipe-friction" curve. This shows the friction loss in the suction pipe for capacities ranging from zero to maximum.

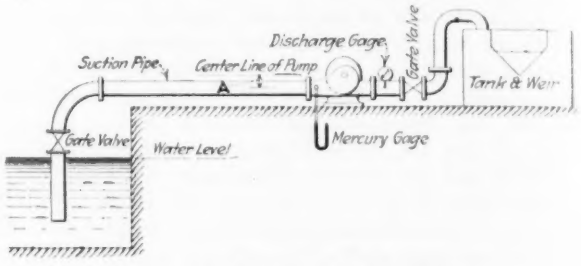
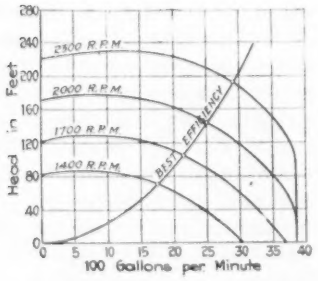
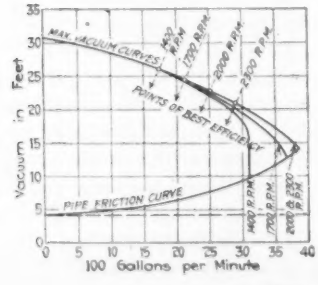
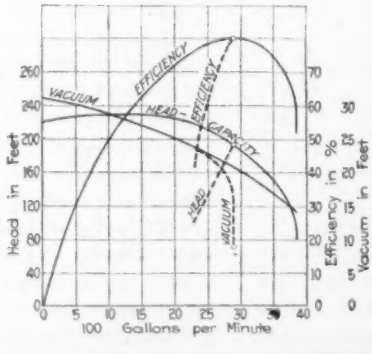


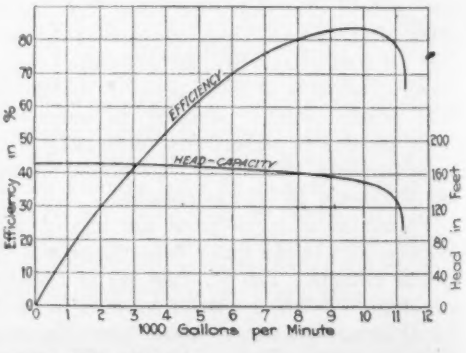
FIG. 1. PUMP-TEST ARRANGEMENT

The pump was then run with the discharge valve wide open, and the valve in the suction line was throttled. This increased the vacuum and decreased the capacity so that, as the discharge valve was always wide open, the maximum capacity for the various vacua could be determined. These readings are plotted in Fig. 3, giving a line here called the "maximum-vacuum" curve. The maximum-vacuum curve and the friction curve meet at the break point. The highest vacuum at the point of best efficiency for 2,300 r.p.m. was, according to the curve, 21 ft.; 13 ft. was therefore expended in forcing the water through the suction









FIGS. 2 TO 5. TYPICAL VACUUM AND CHARACTERISTIC CURVES

*Barrett & Haentjens, Hazleton, Penn. Formerly Chief Engineer, Jeanesville Iron Works Co.

head into the impeller. This head is lost, all except the velocity head corresponding to the velocity increase of the water flowing from the suction elbow into the impeller eye.

Fig. 4 shows the maximum-vacuum curves for 2300, 2000, 1700 and 1400 r.p.m. It will be noticed that for the points of best efficiency the maximum vacuum increases as the speed decreases. An impeller in a volute pump, therefore, when working at the best efficiency point, can produce a higher vacuum at low speed than at high speed. If conditions require high speed and at the same time high vacuum, the pump must be so designed that the condition point on the curve is ahead of the best efficiency point; in other words, efficiency must be sacrificed in order to obtain high vacuum. It will further be noticed that, especially at high speed, the pump rapidly loses its faculty to produce a high vacuum after the best efficiency point is passed and the condition point comes nearer to the break point. Volute pumps having a characteristic curve of the shape shown in Fig. 6 are therefore not suitable for high vacuum.

High Vacuum and Efficiency

So far we have considered only the highest obtainable vacuum and disregarded the efficiency of the pump. In order to obtain the best efficiency it is essential that pump and impeller passages are perfectly filled with water when the pump is running. If the impeller throws out more water than the inlet can pass, the stream in the impeller passages breaks off. The unfilled condition exists for all points along the maximum-vacuum curve.

Referring to Fig. 2, the pump at 2,300 r.p.m. worked most efficiently when pumping 2,900 gal. per min. against 195 ft. total discharge head. From Fig. 3 we know that the vacuum was 9 ft. when pumping this quantity of water with the valve in the suction line wide open. This test was repeated and the discharge valve throttled to produce 195 ft. total delivery head. The efficiency was found to be 80%. The vacuum was then increased by throttling the valve in the suction line, leaving the valve in the discharge undisturbed, and capacity, head and power readings were taken. The efficiency remained constant until the vacuum was increased to more than 16 ft. Then head, capacity and efficiency began to fall until finally, when the maximum vacuum was obtained, head and efficiency had dropped about 50%. The heavy curves in Fig. 5 indicate the change in head and efficiency at the various degrees of vacuum.

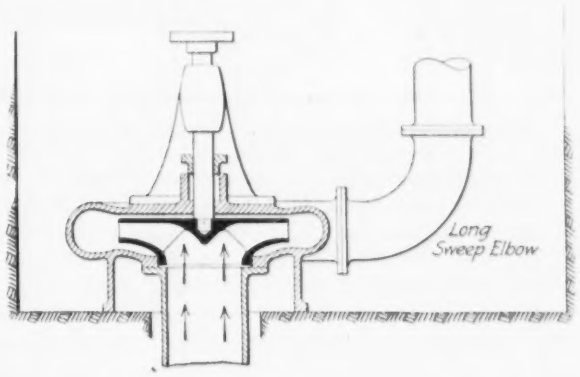
A great number of tests showed that in order to maintain the best efficiency the vacuum must be about 5 ft. lower than indicated by the maximum-vacuum curve. It was also found that when increasing the suction lift from minimum to maximum, the efficiency would in most cases first increase slightly and then decrease. This increase amounted to 1 or 2% and in some cases to 3%. While it is a very difficult matter to make pump tests within such close limits and errors may have occurred, the fact that almost all tests showed the same phenomenon creates the belief that a centrifugal pump works more efficiently on a moderate than on a very low suction lift.

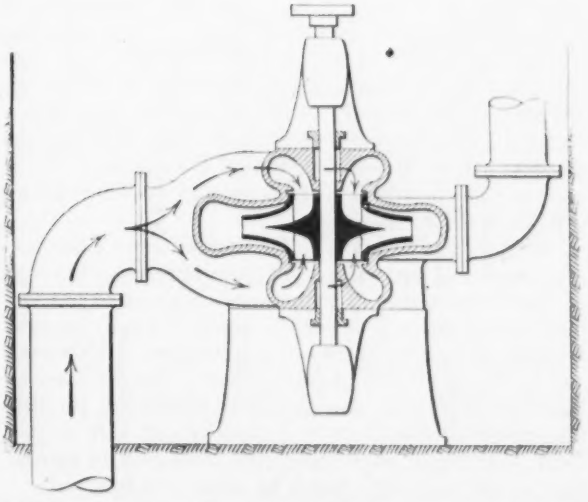
Improved Pump Practice

The foregoing refers to volute pumps without a diffusion ring. The introduction of a diffusion ring makes it possible to use at high speed low velocity in the suction elbows and the impeller eye and still obtain good efficiency.

The many failures of centrifugal pumps working on high suction lifts could have been avoided if the manufacturers had established vacuum curves for their pump casings. The tests should be made with impellers of varying diameter, as impellers having short vanes do not produce as high a vacuum as impellers having a larger ratio of outside to inside diameter. A volute pump working efficiently on 15-ft. vacuum may fall off considerably if the vacuum is increased to 18 ft., and especially pumps having a characteristic like Fig. 5 are uncertain in operation on high vacuum.

For the designer the vacuum curves give a good check on the design of the casing. Suppose the same impeller





FIGS. 6 AND 7. COMPARISON OF SINGLE- AND DOUBLE-SUCTION WELL PUMPS

is installed in two pump casings having the same suction and discharge openings and the vacuum curves are established. The casing that produces the higher vacuum and passes at the same time the greater amount of water will be more efficient. It is of course assumed that the impeller is correctly designed.

The correct design of the suction head, especially of double-suction pumps, is of the utmost importance. Much valuable information regarding the flow of water in elbows and through the impeller is contained in a paper by F. zur Nedden, in the August, 1915, issue of the "Proceedings" of the American Society of Civil Engineers, and particularly in the discussion by C. G. de Laval in the November, 1915, "Proceedings," where he shows that by changing

the suction entrance of double-suction volute pumps the capacity was increased 40 to 50%.

The water in a double-suction pump nowing from the suction head into the impeller has to make a turn of 90°. In a vertical single-suction pump the water flows along a straight path directly into the impeller. Such a pump, therefore, must give the highest efficiency, and it is peculiar that this type has not been more perfected. Instead manufacturers now abandon single-suction vertical pumps and recommend for wells their double-suction pumps set in a vertical position. The space in a well is as a rule very limited; and in addition to the turn the water has to make in the casing, short elbows must be used on the suction and discharge (see Figs. 6 and 7). This is detrimental to high efficiency. The speed of vertical pumps as a rule is not so high, but that single-suction impellers could be used to good advantage; the tendency to substitute double-suction for single-suction is a step in the wrong direction.

Excess Rock Excavation in Catskill Aqueduct Tunnels

By M. E. Zipser*

SYNOPSIS—The author reports the experience in driving nearly 50 mi. of tunnels for the Catskill Aqueduct with respect to the amount of rock excavated outside the surface of the neat tunnel lining. The figures are of value to every engineer who may have to estimate on tunnel construction or to draw specifications for rock-tunnel work.

To engineers and contractors engaged in tunneling work, it is of advantage to have information in regard to the excess excavation that may be expected in driving a rock tunnel, in order that a fairly close estimate may be made of the actual number of cubic yards of rock that must be handled. If the tunnel is to be lined, the data for excess excavation are also of importance in estimating the quantity of masonry required for lining. On contract work, the information is of especial value to enable the engineer to fix, in advance, equitable lines limiting the cross-section in which excavation and masonry lining will be paid for.

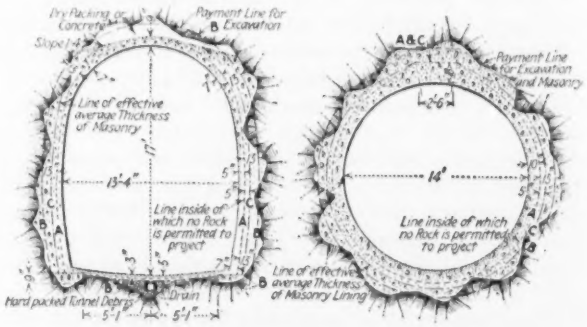
The question of payment for excavation and for concrete outside of the neat lines of a tunnel has been a source of much controversy in tunnel construction and has frequently resulted in prolonged litigation. Where payment is made on the basis of the actual quantities, careless work and increased cost are likely to follow. For it is obvious that where definite lines are not fixed in advance, limiting the amount of excavation and masonry that will be paid for, it is a difficult matter to control the size of the excavation, as the contractor profits by wide breakage.

On the other hand, where no payment is allowed for excavation outside the line defining the minimum required thickness of lining, the contractor does not receive payment for the amount of rock necessary to excavate, since the rock will necessarily break outside of this line. This method of payment, therefore, is unfair to the contractor, particularly where the breakage is very wide through no fault of his. When the Croton Aqueduct was built, no allowance was made for rock excavated outside the specified masonry lines. The contractors sued the city, and after protracted legal proceedings they secured partial payment through an Act of the Legislature.

In this article an attempt has been made to give all the available data on the actual breakage in the excavation of the various rock tunnels of the Catskill Aqueduct. The entire aqueduct, which will convey water from the Catskill Mountains to New York City, comprises a total of 127 mi., of which 49 mi. is in tunnel.

Two standard types of tunnel were employed. These (shown in Figs. 1 and 2) are designated as the grade and the pressure tunnel respectively. The grade tunnels pierce ridges and mountains on the hydraulic gradient, and the pressure tunnels cross the broad and deep valleys. The latter type of tunnel also forms the great distribution main within the city limits. There are 24 grade tunnels in all, aggregating 14 mi. in length, and 9 pressure tunnels totaling 35 mi. The tunnels are lined throughout with portland-cement concrete.

The size of the tunnels and the minimum required thickness of lining vary, the dimensions indicated on the cross-sections being typical of the tunnels in unsupported


Payment Line for B Excavation
Line of effective average Thickness of Masonry
13'-4"
Line inside of which no Rock is permitted to project
Hard packed Tunnel Debris
Drain
A&C
Payment Line for Excavation and Masonry
14'
Line inside of which no Rock is permitted to project
Line of effective average Thickness of Masonry Lining

FIGS. 1 AND 2. CROSS-SECTIONS OF TUNNELS, CATSKILL AQUEDUCT

ground. The pressure tunnels have a finished inside diameter varying from 16 ft. 7 in. to a minimum of 11 ft.

In preparing the plans and specifications for the Catskill Aqueduct under the direction of the Chief Engineer, J. Waldo Smith, an extensive study was made of the breakage of rock in many well-known tunnels. Based on the results of these studies, the lines shown on the cross-sections, Figs. 1 and 2, were adopted.

The *A* line indicated on these sections is the line within which no rock is permitted to project. This line, therefore, defines the minimum thickness of masonry lining and corresponds to the line ordinarily designated in tunnel work as the clearance, or the neat, line. Whatever volume is actually excavated, the specifications provide that payment for excavation will be made to the *B* line, which in unsupported portions of the tunnel is parallel to

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DATA ON TUNNEL BREAKAGE, CATSKILL AQUEDUCT

Rock Formation	Name of Tunnel	Contract No.	Type of Tunnel	Distance Between the A Line and the Average Line of Actual Excavation, In.	Length of Tunnel on Which Data Are Based, Ft.	Remarks
Shales and Slates:						
Hamilton shale	Peak	11	Grade	12	3,350	Firm shale uniform in character, bedding nearly horizontal
Marcellus shale	Rondout	12	Pressure	12⅛	1,770	Rock rather soft, sealed on exposure to air, requiring temporary timber support; dip generally slight, strike approximately 45 deg. to center line of tunnel
Esopus shale	Rondout	12	Pressure	11⅛	5,590	Hard shale, favorable to tunneling; dip generally less than 10 deg.; tendency to break high in north half of stretch, which was timbered
Hudson River shale	Bonticou	12	Grade	11	3,300	Thin bedded, uniform in structure; dip 70 deg. to 90 deg., strike nearly at right angles to tunnel axis
Hudson River shale	Bonticou	47	Grade	15⅛	2,830	Strike generally 25 deg. to 45 deg. to tunnel axis, 40 deg. to 80 deg.; bench broke wide
Hudson River shale	Rondout	12	Pressure	12⅛	5,900	Rock of same general character as in Bonticou grade tunnel. Contract 12
Hudson River shale	Wallkill	47	Pressure	11⅛	22,020	Dip horizontal to vertical, strike about 45 deg. to tunnel axis; rock in northerly half of tunnel rather soft and thin bedded; very hard sandstone in stretches in southerly half
Hudson River shale	Moodna	20	Pressure	13⅛	17,620	Sandstone and shale in heavy beds; strike generally 50 deg. to 85 deg. to tunnel axis; rock blocky in portions with numerous joints and faults
Average, shales and slates				12⅛	62,380	
Limestones:						
Helderberg series	Rondout	12	Pressure	11⅛	2,690	Nearly horizontal bedding; Port Ewen hard and cherty. Becraft broke high in roof, New Scotland blocky, broke rectangular
Inwood	Pleasantville	55	Grade	19⅛	660	Crystalline limestone, partly blocky and broken up by sand seams
Inwood	City	65	Pressure	15	870	Strike nearly at right angles to tunnel axle, dip about 75 deg.
Inwood	City	67	Pressure	17	2,600	Crystalline rock, blocky; strike generally parallel to tunnel axis, dip about 55 deg.; holes in bench drilled too deep
Average, limestones				14⅛	6,820	
Shawangunk Grit:	Roundout	12	Pressure	16	1,890	Very hard quartz conglomerate; bedding nearly horizontal; numerous joint planes tended to break square at bottom
Granites, Gneisses and Schists North of New York City:						
Gneissoid granite	Moodna	20	Pressure	16	6,360	
Gneissoid granite	Moodna	160	Pressure	15	800	Hard granite, fairly uniform, numerous joint planes
Gneissoid granite	Breakneck	80	Pressure	13⅛	740	
Gneissoid granite	Hudson	90	Pressure	13⅛	1,500	
Gneissoid granite	Breakneck	80	Grade	14⅛	1,950	Same as granite above; tunnel excavated by bottom heading
Gneissoid granite	Cat Hill	2	Grade	18⅛	2,350	Heavy joint planes; tunnel very carelessly driven
Granitic gneiss	Bull Hill	22	Grade	15⅛	5,140	Blocky, jointed rock; tunnel poorly driven
Granitic gneiss	McKeel	2	Grade	11⅛	900	Uniform rock; tunnel driven with care
Granitic gneiss	Garrison	2	Grade	15⅛	10,400	Material varied from soft, disintegrated rock to very hard, blocky quartzite; numerous joint planes; portion of tunnel poorly driven
Fordham gneiss	Millwood	55	Grade	16⅛	4,350	Sound hard rock; contractor aimed to excavate sufficiently large to avoid trimming
Fordham gneiss	Sarles	55	Grade	17	5,230	
Manhattan schist	Croton Lake	24	Pressure	15	2,600	Uniform material, some jointing
Manhattan schist	Reynolds Hill	55	Grade	21	2,800	Poor ground, rock much disintegrated and broken
Manhattan schist	Hunter's Brook	23	Grade	20	4,880	Rock varied from soft disintegrated schist to dense, hard, close-grained material badly jointed in places; frequent crushed zones, bottom heading excavation
Manhattan schist	Turkey Mountain	24	Grade	15⅛	1,270	
Manhattan schist	Croton	25	Grade	15⅛	2,990	Rock fairly uniform and sound; some jointing
Manhattan schist	Chadeayne	25	Grade	15⅛	550	
Average, granites and gneisses				15⅛	38,820	
Average, Manhattan schist				18	15,090	
Gneisses and Schists in and Near New York City:						
Yonkers gneiss	Yonkers	54	Pressure	17⅛	10,880	Sound hard gneiss, excessive breakage due to careless and reckless driving; bonus system used part of the time
Yonkers gneiss	Yonkers	30	Pressure	12⅛	1,160	Sound hard rock; very carefully driven, and closeness to lines also due to use of horizontal drill holes, tunnel being driven by bottom heading
Yonkers gneiss	Van Cortlandt	30	Pressure	12⅛	1,790	
Yonkers gneiss	City	63	Pressure	18⅛	7,330	Strike nearly parallel to center line of tunnel, joints very numerous, ground hard and blocky, cut in many places by disintegrated zones; contractor aimed to excavate sufficiently large to avoid trimming
Fordham gneiss	City	63	Pressure	16⅛	11,040	
Fordham gneiss	City	65	Pressure	15	5,860	Rock hard and uniform for greater length of tunnel; some poor ground in northerly portion
Fordham gneiss	City	67	Pressure	17	2,300	Rock hard and blocky with numerous joints, considerably folded and disturbed; holes drilled too deep in bench
Granodiorite (gneiss)	City	67	Pressure	15⅛	2,300	Hard crystalline dense rock
Manhattan schist	City	65	Pressure	15⅛	17,640	Medium hard, generally sound rock, of good quality for tunnel driving; strike nearly parallel to tunnel axis, bedding usually steeper than 45 deg.
Manhattan schist	City	66	Pressure	15⅛	22,270	
Manhattan schist	City	65	Pressure	13⅛	770	Strike approximately at right angles to center line of tunnel
Manhattan schist	City	67	Pressure	17	4,780	Rock of same general character as on Contract 66; bench was drilled too deep, resulting in excessive breakage in bottom
Average, gneisses				16⅛	42,660	
Average, Manhattan schist				15⅛	45,460	

and 13 in. outside of the *A* line, as shown on the sections, Figs. 1 and 2. This 13 in. was determined from the tunnels investigated, as an average figure for the distance that the rock broke back of the clearance line in tunnels driven with reasonable care. The *B* line is also the payment line for concrete masonry where the concrete is placed against the rock.

The *C* line shown on the cross-sections is defined in the specifications as "the line of effective average thickness of masonry lining." The *C* line is placed generally

5 in. outside of the *A* line, and the specifications provide that the lining shall everywhere actually average to the *C* line, the rock being trimmed back of the *A* line where necessary.

In addition to payment for excavation and concrete to the *B* line, the tunnel contracts for the Catskill Aqueduct contain an item called "Excess Concrete Masonry in Shafts and Tunnels," which provides that the number of cubic yards, if any, by which the actual quantity of concrete exceeds the theoretical quantity (measured to the *B* line) for each stretch of 100 ft. shall be paid for at a fixed price, which is either $2.50 or $3 per cu.yd. This item for excess concrete provides some compensation where the breakage is very wide; but as there is no profit in the price stipulated for this item, there is no incentive for the contractor to excavate recklessly. It should be noted here that on all the aqueduct contracts, cement is paid for separately on the basis of the number of barrels actually used in the work.

The relation between the *A*, or clearance, line and the average line of actual excavation in the various tunnels is shown in the accompanying tabulation. The figures are based on cross-sections generally 10 ft. apart, taken in the tunnel either by the Sunflower instrument or by measurements from the forms used for lining the tunnels. The data in the table do not include those portions of the tunnels that were permanently supported either by timbering or steel roof support. In some of these stretches the excess breakage was very large. Particularly so was this the case in the roof where, owing to the character of the ground and other local conditions, various types of support were used. In permanently supported tunnels, the specifications fix the *B* line, or payment line for excavation, 13 in. outside of the support.

The data on tunnel breakage have been classified in the table according to the rock formation. The figures in the table show that, of all the rocks included in this outline, the shales and slates generally broke closest to lines, the average position of the actual excavation line being 12½ in. back of the *A*, or clearance, line, based on a length of nearly 12 mi. of tunnel. Exceptionally good results, however, were obtained in the Helderberg series of limestones, where the distance between the *A* line and the excavation line, as shown in the table, averaged only 11½ in. In the other formations the table shows that the excess breakage, with one or two exceptions, was considerably larger. In the Inwood limestone the distance to the excavation line averaged 17 in., in the Shawangunk conglomerate 16 in., and in the gneisses and granites the distance varied from 11¼ to 18¾ in., the average being about 16¼ in. In the Manhattan schist there is also a wide variation from a minimum of 15 in. to a maximum of 21 in., the very wide breakage occurring in the poor ground encountered in two of the tunnels in the Croton Valley.

While the kind of rock is one of the important factors that affect the breakage, the condition of the rock, the prevalence and direction of joint planes, the dip and strike, etc., are also important. In the same formation the breakage will be influenced according to whether the tunneling is at right angles or nearly so to the beds, or whether it runs along the strike; whether the ground is fairly solid and undisturbed or whether it is broken and crushed. The wide breakage in the City tunnel was in large part due to the fact that the strike generally was nearly parallel to the center line of the tunnel. In the northern portion of the City tunnel, numerous joint planes and the poor quality of the rock also contributed to the excess excavation. In short stretches of the City tunnel, where the tunnel cut across the strike, much closer breakage was obtained.

The closeness to lines depends also on the method followed in driving the tunnel. Some superintendents will excavate a tight section that is subsequently trimmed out, the trimming being done either simultaneously with the excavation or after the headings are holed through.

Others again prefer to excavate sufficiently wide in the first place to avoid the expense and loss of time by subsequent trimming. The latter scheme is probably more economical to the contractor, particularly in hard and tough rocks like granite, which cannot be drilled by the ordinary Jap drills used for trimming in the softer rocks. The percentage of excess excavation, however, must not be so large as to involve the handling of too great a yardage of extra excavation and concrete.

The most important factor in securing a well-driven tunnel, other conditions being equal, is the care used in the placing, pointing and loading of the drill holes. It was the practice of the engineers, generally, during the driving of the tunnels to call the contractor's attention to the results being obtained, by means of cross-sections taken frequently during the progress of the work to show the actual breakage lines. Where the contractor coöperated with the engineer in this matter, excellent results were obtained, the contractor effecting a considerable saving in the amount of excavation and concrete by the close breakage to lines. For example, in the Wallkill pressure tunnel, Contract 47, the actual excavation was approximately 6000 cu.yd. less than the quantity paid for, and the contractor was also paid for 6000 yd. of concrete masonry that was not placed.

The influence of care and organization in the results secured is strikingly illustrated in the case of the Yonkers pressure tunnel, where on two adjacent contracts in the same tunnel the distance between the *A* line and the average line of excavation, as shown in the table, was 17¼ in. on one contract and 12½ in. on the other. The rock was practically identical on both contracts, and the excessive over-breakage in the one case was due to very careless driving, while the excellent results obtained in the same tunnel on the other contract were mainly due to the care exercised by the contractor's superintendent. The use of a large number of horizontal rim holes in the excavation of the lower half of the circular tunnel driven by the bottom-heading method on the latter contract also contributed to the close breakage.

It is on account of the many factors that influence the breakage, as enumerated above, that the position of the actual excavation line as indicated in the table is found to vary widely, even in the same rock formation, and the data assembled should be regarded as furnishing averages under various conditions.

Another point to consider also is that the excavation in the tunnels on which the data are based was governed by the *C* line in addition to the *A*, or clearance, line. Where only a clearance, or neat, line is specified, as is generally the practice on tunnel work, the average line of actual excavation, particularly in rocks breaking close to lines, may be expected to be closer to the clearance line than the figures in the table indicate.

Old Macadam of Little Value as Base for Concrete Pavement

By D. A. Thomas*

That an old macadam road offers but little immediate advantage as a foundation for a permanent surface is the opinion of the Michigan State Highway Department.

Take a specific example: On account of a great increase in automobile traffic an old macadam road a mile in length connecting Lansing and East Lansing, Mich., built in 1906, given a bituminous-surface treatment three years later and two years ago resurfaced with gravel, which was in turn treated in an effort to enable the surface to withstand the traffic, has recently been reconstructed with concrete pavement under the direction of Leroy C. Smith, deputy state highway commissioner.

The improved stretch lies on the route of the Wolverine Pavedway, which is a much traveled through route as well as a most important market road. Over this road most of the traffic to and from the Michigan Agricultural College, located in East Lansing, passes. In addition, the highway is much used for pleasure driving. With the advent of the extended use of the automobile this combination of conditions has caused the traffic to more than triple since the original improvement of the road. The average number of vehicles passing over the road daily is now over 1000, of which approximately 85% is motor driven.

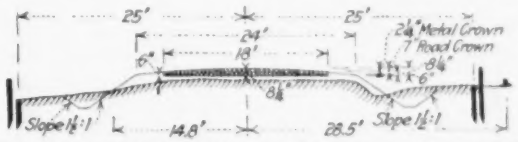
In 1906 the volume of the traffic, though largely horse drawn, necessitated some form of improved road. Macadam was selected in the belief that it would serve the needs of the community for years to come. As originally built, the road was two miles long and extended from Lansing through and beyond the limits of East Lansing, whereas only that portion lying between the two cities has been rebuilt with concrete. The road was constructed in two courses with a limestone base and a top of crushed fieldstone forming a compacted depth of 6 in. The width of macadam was 15 ft. The width between side ditches was 22 ft. The total cost was $13,485, or approximately $6750 a mile. The road was built according to the first specifications of the State Highway Department and was among the earliest applied for, its application number being 27.

For a year or two the commissioners were allowed to enjoy a period of complacent pride in their work. But in 1909 the road had become quite badly rutted, and it was accordingly scarified, reshaped and treated with asphaltic oil by the penetration process. Each year, however, witnessed a large increase in the traffic and a gradual change from horse-drawn to motor-driven vehicles, which left the road in bad condition at the end of the season. In 1914 it was apparent that the road must be resurfaced in some manner. An abundance of good gravel was available, and it was decided to resurface the road with this, since the lack of funds prevented extensive reconstruction. The gravel was placed to a greater depth at the center, to form a small crown, since the old surface had become worn quite flat. When the gravel was thoroughly compacted and shaped, the surface was treated with glutrin.

In the short space of two years, in spite of some attempt at maintenance, the gravel was displaced, and the road became so badly rutted and full of holes that a car could not proceed over it at a speed greater than 10 mi. per hr. without discomfort to the passengers.

This summer, when it was evident that immediate steps must be taken to reconstruct the road with some form of permanent surface, the State Highway Department offered to undertake the reconstruction by force account with funds furnished by local parties and by the county, together with the state reward which the road would merit. Concrete was selected as the most feasible type to build.

It is manifestly poor policy to construct an expensive surface or a relatively long-lived surface on defective grades with poor alignment or where the drainage features are short lived and temporary. As is the case with a majority of the early macadam roads, the grade of this road showed an undulating profile that followed closely the lay of the land. In rebuilding for the future it was deemed best to introduce longer and easier grades. No change in alignment was necessary, but the width of the roadway was increased from 22 ft. to 24 ft., the side



TYPICAL CROSS-SECTION OF CONCRETE PAVEMENT LAID OVER OLD MACADAM

ditches deepened and widened and new culverts with suitable headwalls provided at intervals. The excavation from the ditches was used to widen the roadway.

There is an additional reason, however, why in the majority of instances an old gravel or macadam surface cannot serve at once as a foundation for a concrete surface or pavement having a concrete base. The surface is usually rutted, full of hollows and not uniformly hard. If filled with loose material that is improperly compacted, the concrete slab will be supported on the highest portions of the old bed. This condition will tend to produce cracks and will shorten the life of the pavement. In accordance with this principle the old surface, which, as has been stated, was badly rutted, was scarified, cuts and fills made, and rerolled until uniformly compacted. The old metal taken from the shallow cuts was used where the small fills were necessary.

The concrete was deposited over an 18-ft. width in one course 8¼ in. thick at the center with a 2¼-in. crown. A 1:2:3½ mix with washed gravel as coarse aggregate was used. Expansion joints were placed only at points where the work was stopped for more than 30 min. The length surfaced was 1.083 mi. The total cost was $17,500, or $1.51 per sq.yd.

The writer, as an employee of the Michigan State Highway Department, has been in close touch with the rebuilding of the road and has had access to the facts and information concerning the original construction. It is believed that the conditions surrounding this road are applicable to many old macadam roads in the country. The procedure described in this article is typical of the practice followed in Michigan in rebuilding an old macadam road with a surface of a permanent type.[1]

*Michigan State Highway Department.

[1]In drawing any conclusions from the experience outlined in the foregoing article the reader should bear in mind that a 6-in. limestone macadam road is quite different from the 10- and 12-in. granite and traprock macadam constructed in the early days of the good-roads movement in some of the Eastern States.—Editor.

FIG. 1. VIEW OF LAKE MATTAMUSKEET PARTLY DRAINED
Looking north from roof of partly completed power station. Showing central and east and west main canals, and town site of New Holland

Big Drainage Project in North Carolina with Rural-District Plan

SYNOPSIS—By unwatering Lake Mattamuskeet in Hyde County, North Carolina, near Pamlico Sound, the largest pump-served drainage district in this country—and probably the largest in the world except for the polders of Holland—has recently been opened up. The largest land owners of the district (controlling the entire bed of the lake, which is half the benefited territory) have what is probably the most ambitious rural-district plan that has yet been developed for the physical and social improvement of the locality as an agricultural district.

Lake Mattamuskeet was one of the largest shallow lakes in the East and the largest lake in North Carolina, being some 14 mi. long by 6 mi. wide. It was merely a shallow basin into which the slightly higher land around had drained; although only 8 mi. from the ocean, it had no natural outlet.

The land around the lake has always been notable for its fertility and has been under cultivation for 200 years. The first project to drain Lake Mattamuskeet dates back to 1773. In 1789 a drainage board was appointed for the district—perhaps the first drainage board in the United States. Under its direction a small canal was dug, but it served only to lower the surface of the lake slightly and to keep it more constant. The lake today is about half the extent reported in 1750.

The Drainage Project

Many years ago title to the lake bed passed to the State Board of Education of North Carolina, and it was held by it until sold to the present owners. The present project for completely draining the lake arose about 1909, at which time the help of the United States Department of Agriculture was secured and a soil survey was made. North Carolina passed a general drainage law in 1909, and a special act pertaining to this project. The district included 48,830 acres of lake bed and 50,000 acres surrounding. It proved a difficult matter to define the lake bed, but the state organized a survey and the limits were finally agreed upon with the adjacent property owners.

A plan suggested by J. O. Wright was adopted by the district commission, comprising a main north and south

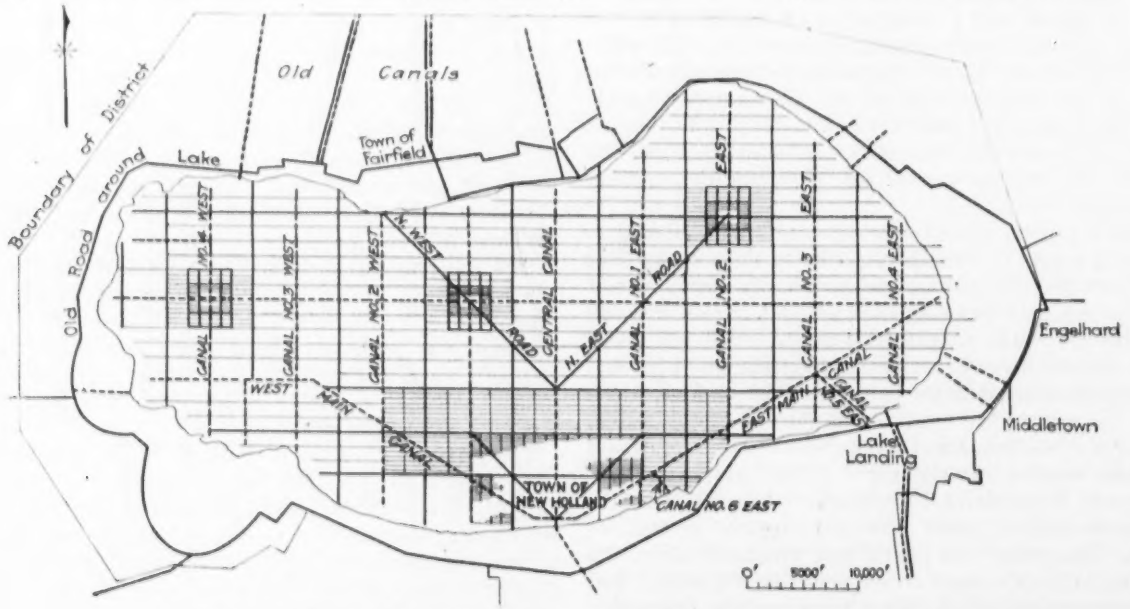


FIG. 2. GENERAL LAYOUT OF MATTAMUSKEET DRAINAGE DISTRICT

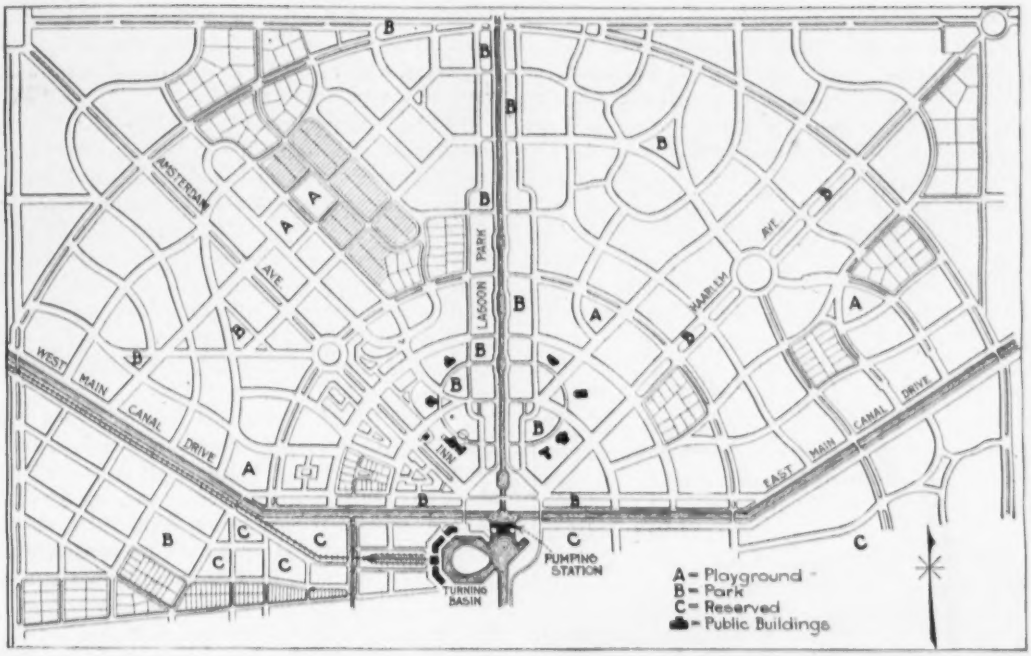


FIG. 3. PLAN OF TOWN OF NEW HOLLAND, N. C.

canal, an east main and a west main, with laterals running into these and all draining into a main sump 300x 100 ft. in area cut to a depth of 13 ft. Immediately south of the sump and projecting over part of it was to be located the pumping station. The outfall canal was to extend from the station to Pamlico Sound. It was found that the difference of elevation between the sump and the canal normally would be 8½ ft., rising occasionally to 10½ ft. The total average rainfall for many years back has been 60 in. The climate is unusually mild, the highest temperature being in the vicinity of 93° F. and the lowest 8° F. above zero. Frosts commence in the middle of November and end with February. The total amount of water to be removed per year is 8,300,000,000 cu.ft. The pumping station was planned to have a capacity for passing 134,000 cu.ft. per min., or about 2200 cu.ft. per sec. At the pumping station are four 72-in. centrifugal pumps, each driven by a compound condensing steam engine. The estimated evaporation and plant growth would use up about 40 in. out of the 60 in. total annual rainfall, leaving only 20 in. to be handled by the pumps, which could be done by working 54 days.

In the construction of the outfall canal over 900,000 cu.yd. of earth was excavated. For the 130 mi. of drainage canal inside the district the excavation amounted to 4,000,000 cu.yd. This excavation was made by floating dredges digging ahead of the canals in which they rode. The outfall canal was constructed large enough for transportation of freight and passengers and now constitutes the main entrance to the locality. A railroad has been projected, and the right-of-way has been graded.

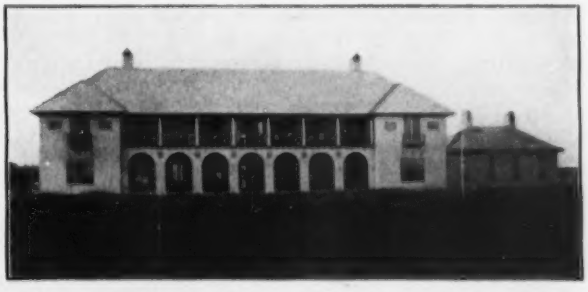


FIG. 5. NEW HOLLAND INN, ERECTED AT TOWN SITE

FIG. 4. VIEW DOWN OUTFALL CANAL

The maintenance of the canals and the cost of operating the pumping plant and of conducting the drainage district as an organization are raised by taxation and are expected to total about 25c. per acre per year.

Large Rural District Laid Out

The 50,000 acres of old lake bottom is now owned by the New Holland Farms, Inc., which has laid out a district into farms and towns, retaining for this purpose consulting agricultural and town-planning experts. The town of New Holland has been laid out surrounding the pumping station. There are three smaller community centers, respectively in the west, central and east sections of the district. In general, the roads are to fol-

low the canal banks, as shown in the accompanying sketches. The west and east main-canal banks furnish diagonal roads partly across the district, and north of these and generally parallel are a northwest and a northeast road. The smaller farms of about 5 acres each are laid out close to the town and community centers. Beyond these are the farms of 20 acres each and outside of these those of 120 acres. The lands of the company have been set aside as a separate township so that the people, whose lands are being developed separate from the older part of the community drainage district, may become a separate political unit and entirely control their own schools, roads, etc.

Each of the 120-acre farms has a frontage of 80 rods on a canal. About half of the canals will give light water transportation to the farm. Each farm will have a main

FIG. 6. NEW HOLLAND PUMPING PLANT

road laid out along the canal frontage. Each of the community centers will have its own post office, stores, church, school, assembly hall and playground.

The town of New Holland, which will be the main center for the whole district, has been laid out by H. P. Kelsey, landscape architect, of Boston. About 40% of the land in the town site has been set aside for parks, boulevards, roads, and sites for public buildings. The latter are located about a central space near the present pumping station. The New Holland Inn, shown in Fig. 5, is the first one of this group of buildings to be put up. It is of concrete, with tile roof, and has been made a much more pretentious structure than the locality at present requires, that it might serve as a model for the future buildings of size.

On account of the very flat area occupied by the town site the only topographical features that could be seized on for the landscape effects were the canals; these have been utilized as much as possible, as will be seen from the accompanying sketches. Roads and parkways line the canal through the town. The main central canal has been expanded into basins at various points for boating and amusements. The business district of the town is to be concentrated in the point of the northwest quadrant between the west and central canals. Outlying (northwest) from this are the smaller town farms, and beyond these the residential farms, extending to the limits of the town site. East of the central canal are the larger residential plots, these growing in size as the distance from the center increases. The southwestern quadrant is reserved for colored people. Provision has been made for a railroad coming in alongside the west main canal to a station and freightyard close to a turning basin, which is planned for ultimate excavation southwest of the pumping station.

The land company has engaged to set aside, out of the proceeds of sales, $100,000 to be spent for building and planting roads, boulevards and parks, for bridges, schoolhouses, community centers, permanent public buildings, etc. The company has also agreed that $100,000 shall be set aside out of the sales as a permanent endowment fund for variously promoting the welfare of the district—for arousing interest in agricultural developments, for maintaining the parks and playgrounds, for beautifying the locality, providing lectures and other entertainments and for hiring a social secretary.

The older land around the lake has been selling for from $100 to $175 per acre. The new lands scale down from those figures. A half-million dollars of 6% bonds of the district has been issued at par, one-tenth to be redeemed each year beginning with 1916, the sum required being provided by taxation against all the lands in the district, rated in accordance with the benefits received. This money has been spent, approximately $200,000 for the pumping plant and $300,000 for the canals, amounting to about $5 per acre average expenditure, compared with an average price of about $13 for such work elsewhere in the country.

The members of the Mattamuskeet Drainage Commission are D. N. Graves, of New Holland (also president of the New Holland Farms); David H. Carter, of Fairfield; and J. S. Mann, of Raleigh. The engineer for the district is Lawrence Brett, of Wilson, N. C., and E. M. Chapple is resident engineer.

⌘

Largest Drainage Pumping Plant Is at Mattamuskeet

The pumping plant built at New Holland, N. C., for unwatering Lake Mattamuskeet and for draining the lake bed of rainfall is believed to be the largest single drainage station, as well as one of the most interesting plants, built in this country for such work.

The station is a steel-framed brick structure, 76 ft. 9 in. wide (over roof) and 205 ft. 9 in. long, resting on a concrete substructure and pile foundations. It consists of a 205-ft. 9-in. by 34-ft. 8-in. engine house and

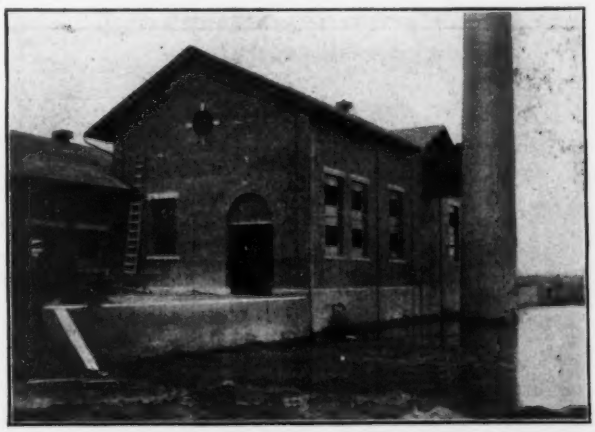


FIG. 1. BOILER HOUSE AND DISCHARGE BASIN

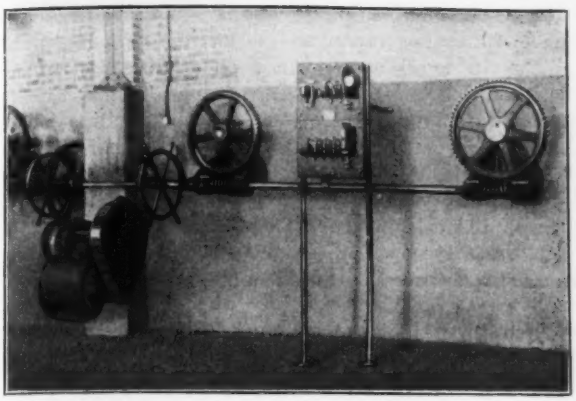


FIG. 2. OUTLET-GATE CONTROL, MATTAMUSKEET

a 108-ft. 10-in. by 45-ft. 8-in. boiler house adjoining, as shown in Fig. 4. Inside are four 850-hp. cross-compound steam engines driving four 72-in. quadruplet double-suction centrifugal pumps, each capable of delivering 36,000,000 gal. per day (560 cu.ft. per sec.) against a head of 8½ to 10½ ft.

Station Structure and Substructure

The structure that houses the boilers and pumping units is shown in its details by Fig. 4. There is nothing unusual about the superstructure—13-in. brick walls with steel columns buried in pilasters supporting each roof truss and the crane runway. Window openings have steel sash. The roof is covered with concrete tile. The boiler and engine rooms have one roof ventilator each; the boiler room has a ventilating space of 12 in. between side walls and roof sheathing.

The substructure is of interest, showing economy of concrete and separate foundations for machinery, boilers, stack and wall footings. The underlying soil consisted of layers of sand and mud down to 20 ft. depth, where sand and shell was struck. Cypress piles 8 in. by 27 ft., were driven to 5-ft. penetration of the sand-shell stratum for all the foundations (at which depth the *Engineering News* formula gave 40,000 lb. safe load), and the tops were embedded in the concrete footings.

The substructure forms a dam with 8½- to 10½-ft. head of water against it, that being the level between the outfall basin and the intake sump. The foundations and footings had to be designed to withstand side load as well as vertical. Instead of making the south (outfall) wall of the boiler room of heavy gravity section, able to withstand overturning, it was kept an 18-in. concrete wall, but it was braced on 16-ft. 4-in. centers by 8x10-in. reinforced-concrete struts going to the boiler foundations and by other struts going from the boiler foundations to the 20x30-in. columns of the middle wall. The connection of every other pair of struts to the boiler foundations was made by 15x16-in. and 12x16-in. beams, as shown in the details of Fig. 4. There is no connection to engine foundations. The stack is a separate reinforced-concrete structure 230 ft. high. The dock walls on either side of the boiler house are anchored to the two discharge pipes pasing through them; these pipes are independent of the boiler-room wall.

Pumping Equipment

The pumping units are the largest centrifugal machines yet built—having a capacity of 560 sec.-ft., or 250,000 gal. per min., or 360,000,000 gal. per day, thus equaling the huge New Orleans screw pumps. While properly spoken of as a single mechanical unit, each one of these pumps is in its hydraulic design four single-stage double-suction pumps working in parallel between two suction tubes and two discharge pipes.

These four runners are mounted on one shaft coupled between the high-pressure and low-pressure sides of a cross-compound condensing Lentz poppet-valve engine.

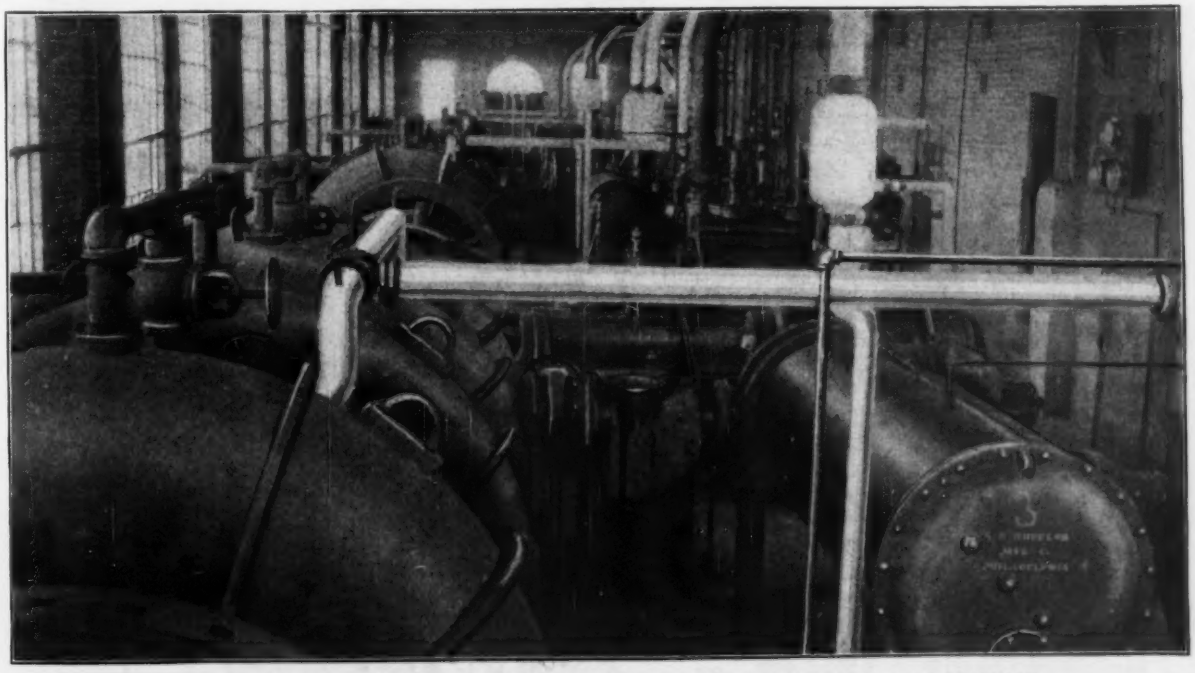


FIG. 3. ENGINE ROOM OF PUMPING STATION, MATTAMUSKEET DRAINAGE DISTRICT

Each engine is rated at 850 hp., having 21½- and 36x 27-in. cylinders, running at 170 r.p.m. and taking steam at 175 lb. gage and 250° superheat. A 10-in. pipe 31 ft. long crossing underneath the floor from high-pressure exhaust to low-pressure intake serves as the intermediate receiver. The final exhaust goes down under the floor through a gooseneck and comes up under a surface condenser located close to the main pumps. An 8-in. water line is led off the casing of one of the parallel stages of the main pumps through a strainer to furnish cooling water which is returned to the main-plant sump. The condensate is taken off to feed-water heaters by a small reciprocating pump on an extension of the vacuum-pump piston rod. The boiler feed pumps (two) are in the middle of the boiler room close to the feed-water heaters. Makeup pumps in the engine room draw from driven wells outside the boiler house (or from the main sump) and deliver to the feed heaters. A small high-

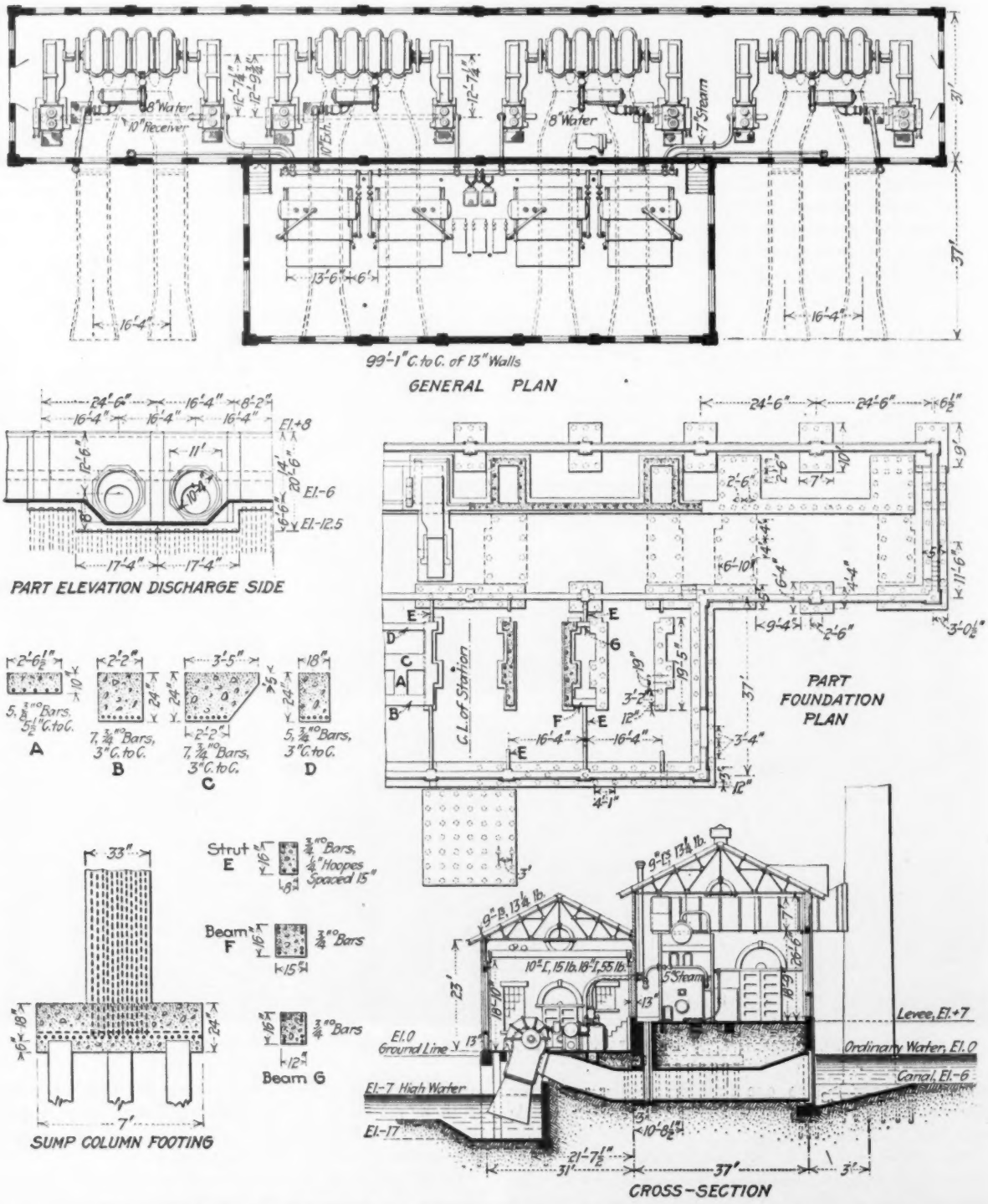


FIG. 4. CONSTRUCTION DETAILS OF MATTAMUSKEET PUMPING STATION, NEW HOLLAND, N. C

speed 25-kw. turbine-driven unit furnishes light and power for the station service. The auxiliaries exhaust to the feed-water heaters.

A gate well is built into the concrete outlet pipes just south of the engine-room wall. This has gate grooves and stop-log grooves. The gates are heavy timber slides, solid in the lower third and a simple but stiff truss for the upper thirds. They are lifted by racks on each edge, engaging pinions on short shafts going through the engine-room wall, where they end in large gears driven by worms on countershafts. One shaft is provided for each pair of gates belonging to one pumping unit. Each shaft is driven by a 10-hp. direct-current motor, but it can be hand operated. One of these shafts is shown in Fig. 4, together with the worm gearing, handwheels and the starting panel for the four gate motors.

The pump suctions are built of steel plate and are bolted to the suction castings of the pumps. Steel pipes bedded in 6 in. of concrete connect the discharge opening of the pump to the concrete discharge pipe leading under the station to the outfall canal basin.

The space between the piers supporting the north wall of the station is screened with 2¼x¼-in. steel rods spaced 2¾ in. apart, serving as a trash rack, which may be entirely removed without diving.

In the boiler room are four vertical-type steel-case water-tube boilers, each equipped with a superheater. The pipe and pipework follow common practice, except that forged steel headers and nozzles are used, steel valves with nickel seats, steel separators and traps designed for superheated steam. There are two 800-hp. open feed-water heaters taking the condensate before it goes to the hot well and employing the exhaust of the auxiliary pumps and turbine generator.

The main pumps were built by the Morris Machine Works, of Baldwinsville, N. Y. The Lentz engines were designed and built by the Erie City Iron Works, which also furnished the boilers. The condensers and condenser pumps were made by the C. H. Wheeler Manufacturing Co. The station was designed by Thomas B. Whitted, of Charlotte, N. C., representing the Morris Machine Works, assisted by H. C. Tripp, T. C. Heyward and the engineering department of the Morris company. The contract was let by the drainage district to the Morris Machine Works, and H. C. Tripp became the resident engineer for the contractors. The engineer for the district is Lawrence Brett, of Wilson, N. C., and E. M. Chappel is the resident engineer.

Engineer-Referee Supervises Drainage

In a paper before the Minnesota Surveyors and Engineers Society, E. G. Minder, an engineer serving as referee in ditch matters of the thirteenth judicial district of Minnesota, described methods of handling the work in his district.

Under the laws of Minnesota a judge having considerable ditch work under his jurisdiction can appoint a referee, and this referee can employ the necessary clerks for compiling such detailed accounts of the work, cost data, etc., as the judge may require. The purport of the law is to provide for an exact accounting for the people interested in the ditch and for the public examiners' accounts. By appointing a civil engineer to this position the judge provided his district, in reality, with a supervising engineer, and it was in this capacity that the referee rendered his principal service.

The present method of providing engineering services for drainage is to appoint an engineer who is recommended by the people interested in the ditch. During the past year Mr. Minder has had some ten engineering organizations reporting to him. A system was devised for getting daily report cards from each party, giving the name or number of the ditch, date, names of the men in the party, occupation, rate paid, expenses and total expenses and also the work accomplished each day. This work is done in the office of the referee, who personally spends considerable time in examining the proposed ditch in the field and checking the design and estimated cost as submitted by the engineer in charge and making a report to the judge.

To expedite this work, Mr. Minder has reduced computations of the flow of water in tile and open ditches and the estimated costs to curves plotted on coördinate paper. The capacities of the various sizes of tile and open ditches can be determined in the terms of acres of watershed for any desired hydraulic grade and run-off coefficient, directly from the plotted curves. From average experience curves have been prepared which show the cost of digging, laying and filling for the various sizes of tile and depths of ditch. From the current prices of tile and the average cost of hauling, a chart is made on which is shown, in the form of curves, the cost of tile delivered at the job for different lengths of haul up to 20 miles.

In checking the design, the data of a ditch are set forth on a drainage sheet in tabular form. On this are shown the sections of the ditch, the hydraulic grade, the velocity of flow, the acres of watershed, size of tile required and capacity of tile chosen. The drainage areas are measured from a scale map with a planimeter.

In the matter of inspecting ditches during construction there was some difficulty experienced in providing competent inspection on small ditches at a cost that was not prohibitory. This difficulty was overcome by grouping the ditches, whether judicial or county, according to location and assigning one inspector to each group.

If all the work that comes up in the district were assigned to one organization instead of divided among ten, the volume of business would permit the employment of men particularly fitted for each of these branches. These men would receive the pay that is due them for the class of work on which they are employed and no more. Engineering on drainage work would then be raised to a much higher standard degree of skill and efficiency, at a lower cost than is possible under present conditions. Men could be employed on work that is of general benefit to all drainage in the district. Each ditch would then receive the benefit of high-grade skill at a reasonable cost. Continuous employment would be assured, to a large part of the organization at least.

An organization that would realize the benefits and economies which are possible in carrying on a large volume of business would probably be divided into locating and construction departments and the office force.

In case contracts for furnishing tile were let directly to the manufacturers the inspectors assigned to work at the tile factories would be expected to oversee the proper shipment of tile besides attending to their other duties of inspection and testing.

Features of a City Viaduct Over Railway Tracks

The problems of solid-floor construction under conditions of minimum clearance and depth and protection from locomotive gases were the chief factors in the design of the Himrod Ave. viaduct in Youngstown, Ohio. The existing steel-truss viaduct here, which connects East Federal St. with Himrod Ave. across a wide belt of railway tracks, is seriously corroded and has been dangerously weak for some years. The city and three railways were interested in its renewal, and finally by agreement of all parties the design and construction were turned over to the New York Central Lines West, which pays the largest share of the cost.

Ample experience with solid-floor construction was furnished by the Chicago street crossings built by the Lake Shore & Michigan Southern Ry. in its track elevation eight years ago. These have reinforced-concrete slab floors resting on either longitudinal or transverse I-beams, and up to now have remained perfectly tight, showing no cracks, seepage or local staining, in marked contrast to neighboring crossings with concrete-filled trough flooring. The same construction was therefore applied to the Himrod Ave. viaduct, with the addition of concrete incasement for all steel exposed below the floor.

The difficulties of grade and clearance conditions can be seen from the general drawing, Fig. 4. To avoid excessive grades the floor had to be made as thin as possible. Two different floor arrangements were made necessary by the layout of supports, which called for a skew plate-girder span of 113 ft. (with intermediate pos- on one side) and a series of short spans on which lon- gitudinal I-beams could be used. The floor on the plate girder span rests on transverse I-beams spaced 8 ft., whil- the floor on the short spans rests directly on the longitu- dinal beams, partly embedding them. Fig. 1 shows both floors in some detail.

Depressed troughs are formed to receive the street-car track construction. Steel spacer ties and concrete ballast

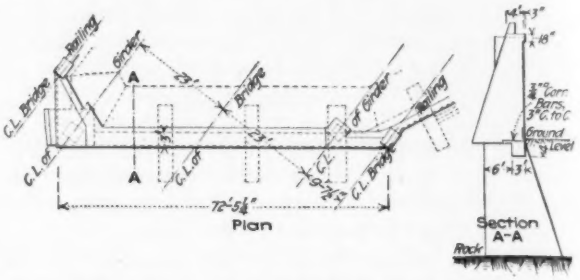


FIG. 2. INDIVIDUAL PIER FOUNDATIONS OF ABUTMENT CARRIED TO ROCK

will be used for the track, giving a level concrete foundation for the wood-block surface.

The beam-span floor with its integral parapet forms a complete concrete trough, but in the plate-girder span

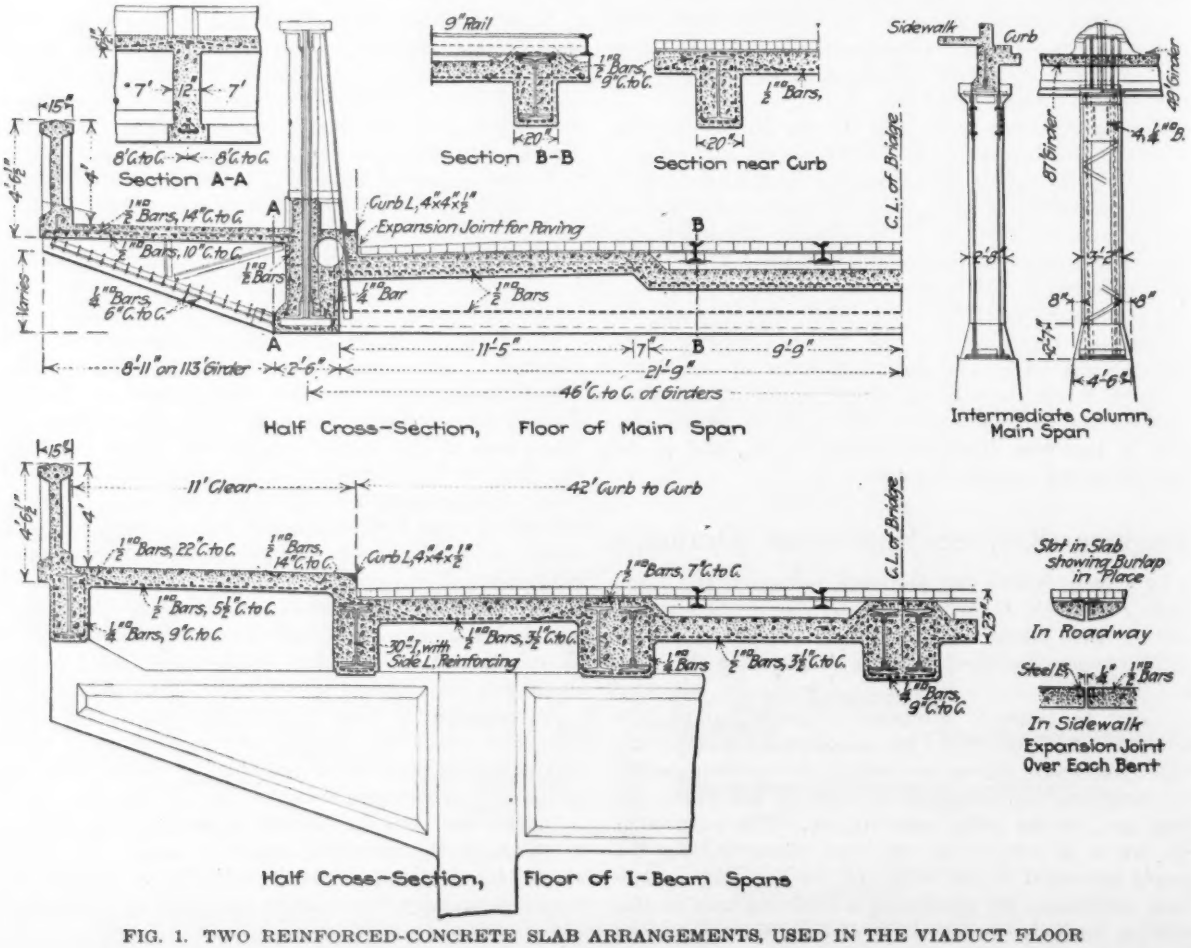


FIG. 1. TWO REINFORCED-CONCRETE SLAB ARRANGEMENTS, USED IN THE VIADUCT FLOOR

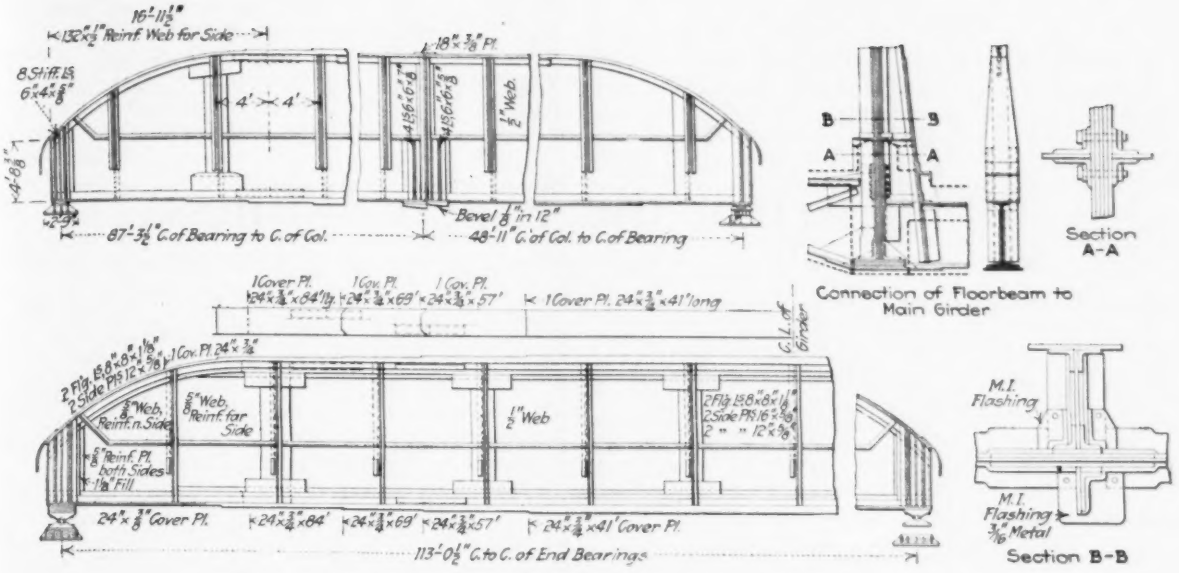


FIG. 3. DETAILS OF LONG-SPAN PLATE GIRDERS

special detailing was necessary to secure such a trough. A longitudinal angle riveted to the girder web (Fig. 3) forms a finish ledge against which is joined the concrete carried up along the side of the web. The finish angle is continued around the stiffeners of the girder by small malleable-iron castings.

The steel bents supporting the beam spans are incased in concrete, as indicated in Fig. 1. At only one point was sufficient width available to permit using a concrete bent. All incasement is strengthened and tied in by rods. Mesh was avoided, as making it difficult to secure solid concreting.

Some features of the steelwork invite study. The beam spans involve bending moments large enough to make even double 30-in. I-beams inadequate at the car tracks, without flange reinforcement. In place of flange plates, commonly used for such reinforcement, 7x3 ½-in. side angles are used, riveted to the web directly under the beam flanges.

The plate-girders of the long span have the top flange curved down at the ends, for the sake of appearance. As this reduces the shear section of the web, reinforcing webs are riveted to the end portion.

The manner of attaching the floor beams and the construction of the top flange braces are shown in the drawing. The sidewalk bracket is fastened at its upper edge by bolts, which transmit the cantilever tension through the girder web to the brace on the inner side.

One of the two girders could be supported by an intermediate post; and the girder is therefore made in two sections, although the opposite girder is a single span. Where the girder sections join over the post, they are butted squarely and are lightly riveted together through the outstanding legs of the abutting stiffener angles. The top flange has a small cover-plate, but slotted holes prevent the transmission of bending moment.

The two girders are a unit with respect to expansion, a roller bearing being placed at one end. The bearings depend on simple beveled rocker plates for flexibility, whereas the long girder has pin-bearing shoes.

One of the abutments of the viaduct shows unusual construction because of the foundation conditions. Rock is

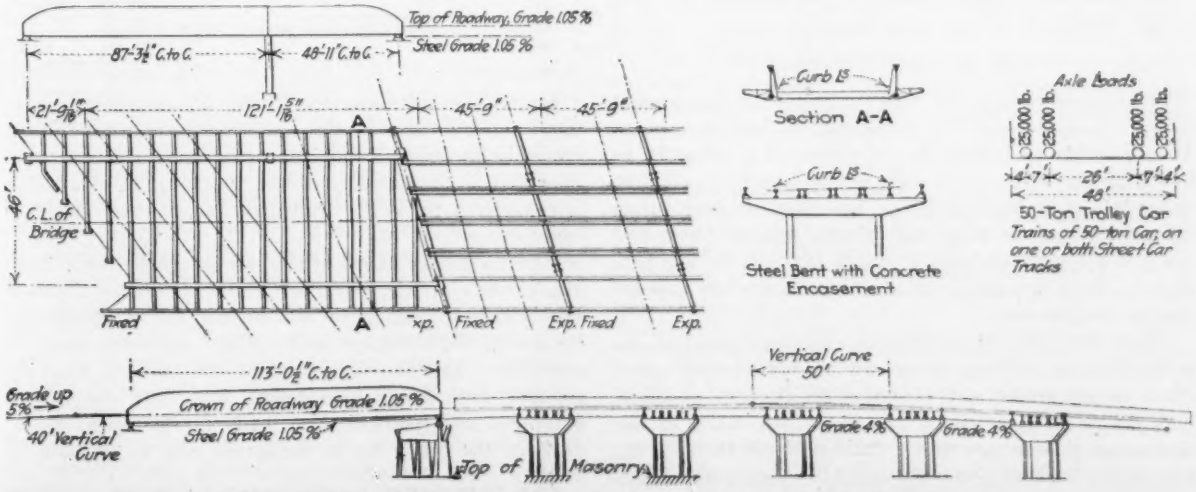


FIG. 4. GENERAL SKETCH OF HIMROD AVE. VIADUCT, YOUNGSTOWN, OHIO

only about 25 ft. below ground surface, and with a view to future depression of tracks it was thought safest to carry the abutment down to rock. The difficulty and cost of going down with the entire base of the abutment close to a creek channel led to the expedient of carrying down only isolated piers, the abutment spanning across these piers. Fig. 2 sketches part of this abutment.

The design was made under the direction of B. H. Lefller, Bridge Engineer, New York Central Lines West, Cleveland, Ohio.

The Art of the Expert Witness

(CONTRIBUTED)

SYNOPSIS—An answer to the question, "Why do engineering experts' opinions differ, particularly in valuation matters?" The cause is traced to differences in basic hypotheses which the opposing attorneys place before their respective experts. Complementary to a previous article on the good presentation of expert testimony.

II. When Experts Differ

In a previous article the writer offered some suggestions, based on experience, for increasing one's efficiency in the presentation of expert testimony. In the present paper it is proposed to turn aside from that phase of the art of the expert witness to comment on one aspect of expert testimony that apparently is attracting much attention.

Briefly, why is it that the opinions of experienced and qualified engineers and other experts on technical matters often differ so widely? One not infrequently hears the opinion expressed that this difference necessarily implies dishonesty or at least lack of candor on the part of one side or the other. Again, there is a certain group of persons, not a few lawyers among them, who hold that the wide difference of opinion among experts is a very pernicious matter, that it is due to the cupidity of the experts, and that experts as a class are dishonest and unreliable.

A litigation primarily involves a marked difference of opinion between the two sides, otherwise there would be no litigation. Looking at the situation broadly, is it more inconsistent that engineering, or medical or other experts, should differ in their opinions on complex and often uncertain questions than that the attorneys of their clients should so differ?

IN VALUATION CASES

Differences of opinion between opposing engineering experts become especially noticeable in valuation cases. It is possible to inflate the valuation of a property to any multiple of its real value, but it is only possible to depreciate it to zero or 100% less than its first value. Therefore, it is evident that abuses arising from this practice are more obvious, although ethically no less pernicious, when appearing on the high than when appearing on the low side.

There undoubtedly are among engineers so-called experts who are willing, in answer to hypothetical questions, to put almost any valuation an attorney or client may desire on a property. It is not too much to say that unscrupulous experts are enabled to remain in practice largely because some lawyers hire them—sometimes unwittingly, sometimes with intent.

This is not a mere abstract theory; in one city a self-styled engineer, rejected for membership in a leading engineering society, has been retained many times during the last few years as an expert on technical cases, his engagement always emanating from the attorneys. Not once, so far as known, has he been called upon to collaborate by reputable engineers.

Even where the experts are fair-minded and capable, wide differences of opinion in valuation occur. The question arises: Who is to blame for these apparent abuses in valuation cases? These troubles are not confined to engineers. They are at least equally common among real-estate men, among merchants acting as witnesses in the valuation of merchandise, and among farmers in the valuation of crops. Apparently then, exorbitant and deficient valuations under oath must result from some inherent defect in the methods of court procedure.

HYPOTHESES THE FAULT

Valuations are mostly opinion evidence. They are sworn to not as absolute facts but as opinions. In general, they are in response to some hypothetical question describing in more or less detail the elements of value of the property being valued. The opinions given are or should be in accordance with the hypothesis assumed. Herein lies the cause of most of the differences among experts in physical valuations.

A recent Los Angeles case has been cited as illustrating the wide differences among engineers in valuations.[1] The valuations presented by the opposing sides are quoted as follows:

		Company's Estimate	City's Estimate
1.	Cost of Physical Property:		
	Historical reproduction, less depreciation	$4,200,000	
	Reproduction new, less depreciation		$3,473,803
2.	Going concern or franchise value	5,187,623	Not given
3.	Bond discount, etc	380,340	Not given
4.	Damage by isolation of substation	416,000	Not given
5.	Expense of rebuilding transmission lines	1,000,000	Not given
6.	Severance damage	10,706,103	414,035
	Total	$21,890,066	$3,887,838

Mr. Cooke intimates that there is something highly iniquitous in these results and that it will be difficult "to make progress in building up a sound and just utility policy in this country so long as this kind of a result is considered to be the legitimate outcome of valuation engineering."

Now the writer knows of the case referred to only from Mr. Cooke's article, but the figures themselves indicate clearly that the difference was mainly one of hypothesis, for which the attorneys and not the engineers were responsible. The two valuations of the physical property are not wide apart, considering that here again is a difference of hypothesis, one being for historical reproduction, the other for reproduction new as of date of

[1] "An Open Letter to Engineers," by Morris Llewellen Cooke, "The Utilities Magazine," July, 1916.

the valuation. The city's experts evidently worked on the hypothesis that items 2, 3, 4 and 5 did not exist or were not involved. Had they assumed, for example, that transmission lines were to be rebuilt physically identical with those assumed by the company's experts, there would necessarily have been some value under item 5 in the city's estimate.

This example will illustrate a common experience that opposing engineers may agree closely as to actual physical value and reproduction cost, and yet their gross valuations under different hypotheses as to intangible and other disputed elements may throw the resulting valuations wide apart. The fault in such cases lies largely in the present unsettled and unsatisfactory state of judicial procedure in valuation cases, but little less with the attorneys, and only to a minor degree with the engineering experts themselves.

In framing a hypothetical question, the attorney for the plaintiff construes questions of doubt in favor of his client, and no doubt properly so. On matters where the law is in dispute—and there are many—the attorney assumes that the court will rule in his favor, assumes a state of law favorable to his client in framing his hypothetical questions and advises his experts accordingly. The opposing attorney with equal propriety construes these same questions of doubt oppositely. Thus it seldom happens that the foundation for the hypothetical questions is the same on both sides, and the answers accordingly should, and indeed must, be different.

On cross-examination, the expert who has answered a hypothetical question is very likely to be asked if his opinion would have been changed had he made the same set of assumptions which were made in the hypothetical question covering the same set of facts as presented by the opposition. Such questions usually bring out little of real value. The reason will appear. The expert who has given long and careful study to a situation in order to formulate his opinion on a certain assumed set of facts is practically incapable of giving, at a moment's notice, the opinion which he would have held if the given set of facts had never been before him at all, and an entirely different and somewhat opposite set of facts had been given an equal amount of study. In other words, the fundamental reason for differences in opinion is, in general, differences in the complex of facts and conditions on which the opinions are based.

A Chance for Improvement

While it is undoubtedly true that an expert in any capacity should not assume the rôle of advocate, yet it is equally true that under existing methods of court procedure, for which the legal and not the engineering profession is largely responsible, the engineer-expert must in fairness to his client largely construe questions of doubt in his client's favor. In any event, he will often be forced to do so by the attorneys, by virtue of the form of hypothetical questions used.

It is not to be disputed, however, that there is room for very material improvement in the technical character of expert testimony. In the majority of cases there is no reason why there should be any real or material difference in the estimates of opposing experts in such a matter, for example, as the average rainfall over a given drainage basin where both sides have derived their estimates from rainfall at the same stations and for the same periods. The great engineering societies should, through committees, establish and promulgate so far as possible standard methods of engineering practice on a wide variety of subjects not now standardized.

The subject of hydraulic and hydrologic calculations especially offer inviting opportunities for such standardization of practice. It can be shown, but limitations of space forbid its presentation here, that there is one and only one solution of each of a wide variety of hydrologic and hydraulic problems which meets the test of using all the available information in the best manner possible. If, where practical, standard methods in engineering practice and in computations are adopted which meet this requirement, then opposing experts, working from the same data, will reach the same results much more frequently than at present; because, in a given case, an expert would either use a standard method as a basis for his computations, or he would subject himself to the necessity of giving adequate reason for failing to do so.

Partisan Versus Neutral Experts

Because of the difference in opinions prevailing among experts, some have held that present methods of procuring expert testimony should be done away with, and that instead, when the court requires expert advice, it should secure it independently of either of the parties to the action. The writer does not see any great benefit in that scheme. The present method procures for the court in general a perspective view of the full range of conditions involved. Substitution for this of a system of experts in the employ of the court would in general procure for the court only a limited exposition of the conditions involved. There is hardly an expert who has not had his own view of a subject broadened, his knowledge increased and his ideas clarified as the result of the presentation of the opposite aspects of the subject by opposing experts.

The body of the law itself as it stands today represents the crystallized experience of centuries past. Judicial procedure by virtue of its nature cannot be modified in advance to meet changing conditions. A system of aërial jurisprudence could not well precede the development of the aëroplane. The railroad and steamboat were precursors of modern transportation law. The engineer on the other hand is the advance agent of material progress. By his foreknowledge he should be able to aid greatly in establishing right precedents at the start, in matters of legal procedure involving new conditions. But in order to secure the recognition he deserves in shaping matters of new jurisprudence, the engineer must first train himself to perform the functions of an expert witness in an efficient manner.

The New York City Death Rate for 1916 was 13.89. This was the lowest death rate on record, notwithstanding epidemics of influenza, infectious colds and poliomyelitis—the latter causing 2448 deaths and giving a rate of 0.44 per 1000. As recently as 1900 the total death rate was 20.57. In 1910 it had fallen to 16. Since then the figures have been: 1911, 15.3; 1912, 14.41; 1913, 14.21; 1914, 14.03; 1915, 13.93; 1916, 13.89. From 1910 to 1916 there have been reductions in infant mortality from 125.6 to 93.1 per 1000 births reported; in typhoid fever, from 0.12 to 0.4 per 1000 population; and in tuberculosis, from 1.81 to 1.5. Measles, scarlet fever, diphtheria and croup declined materially from 1910 to 1916, but whooping cough showed little change. There have been material increases in organic heart diseases, Brights' disease, nephritis and cancer during the past seven years. The actual number of deaths from typhoid was 558 in 1910 and only 215 in 1916. The population of the city in 1916 is estimated at 5,602,841.

Crack in New Concrete Arch Explained by Freezing of Pocketed Water

By A. W. Zesiger*

SYNOPSIS—One rib of a 145-ft. concrete-arch span cracked nearly through. Attempts to explain the crack as being the result of arch stresses did not give a plausible result. A pocket of porous concrete found in the arch at the crack contained water, and freezing of this water in the winter of 1915-16 is thought to have split the arch.

The news items of *Engineering News* of Aug. 3, 1916, contained a short article concerning the appearance of a crack (see Fig. 1) in one of the arch ribs of the Detroit-Superior Bridge at Cleveland, Ohio. There was nothing contained in the article ascribing a cause that might have produced this crack, although, indeed, a very perplexing problem was presented to anyone who attempted to explain why it occurred at that place and what caused it to follow an almost horizontal direction instead of following a plane normal to the linear arch.

Porous Pocket Found in Interior of Concrete

A section of the arch rib was cut out, after the load of the arch had been transferred by means of 122 five-ton screw jacks to the steel arch centering replaced under it, and at the time the article in question was written all indications were that the concrete was of good quality. However, when the work of cutting out had progressed far enough to reach the horizontal crack, there was discovered a pocket 21 in. wide and 42 in. long of honeycombed material following the plane of this crack.

In order that conditions at the time the crack occurred may be more fully understood it is necessary to give the actual sequence of construction. It was originally intended that the work of construction should start at the easterly end of the steel span (Fig. 2) and progress easterly. This, however, could not be done, because the erection of the 591-ft. span across the river was begun by the King Bridge Co. simultaneously with the construction of the arch ribs by the Hunkin-Conkey Construction Co., contractor for the concrete superstructure. It was decided therefore to begin with the second arch east of the steel span—that is, the arch between Piers 5 and 6, and progress easterly therefrom. This produced considerable eccentricity on Pier 5, but calculations predicted that the soil pressure was within safe limits.

The arch rib in which this crack developed was the first one constructed, having been poured May 27, 1915. Careful observations were made of the settlement of all the piers, but Pier 5 was also closely watched with reference to any horizontal or tipping movements. On May 1, 1916, the crack in question was first observed.

Fig. 3 is intended to illustrate the sequence of the work. As will be seen, the arch ribs only were constructed between Piers 5 and 6, the arch ribs and first floor between Piers 6 and 7, continuing thus to increase the load the farther the work progressed from Pier 5.

Piers of Cracked Arch Rocked Under Unbalanced Loads

Before proceeding very far it was discovered that the top of Pier 5 was moving westerly, caused by the unbalanced load on the pier. The movement advanced to such a stage as to threaten the stability of the structure.

At this point the King Bridge Co. had lowered the steel arch into place and had released the backstays that extended from Pier 4 to Pier 5. The lower chords of

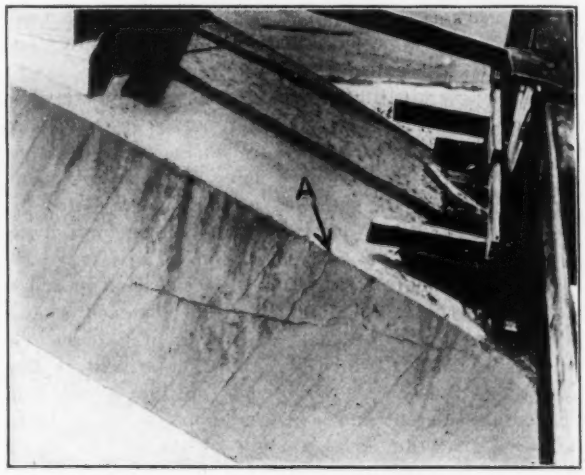


FIG. 1. VIEW OF CRACK IN ARCH 6, DETROIT-SUPERIOR VIADUCT, CLEVELAND

these stays consisted of strong lattice girders. It was decided to use these girders as struts between Piers 4 and 5, and by so doing prevent any further movement of the latter pier.

Movements in Pier 6 were discovered proceeding simultaneously with those of Pier 5. Therefore, after having placed these struts, the work of pouring the first floor on the arches between Piers 5 and 6 was begun, as it was thought best to increase the load on these arches. Observations indicated no further movement of

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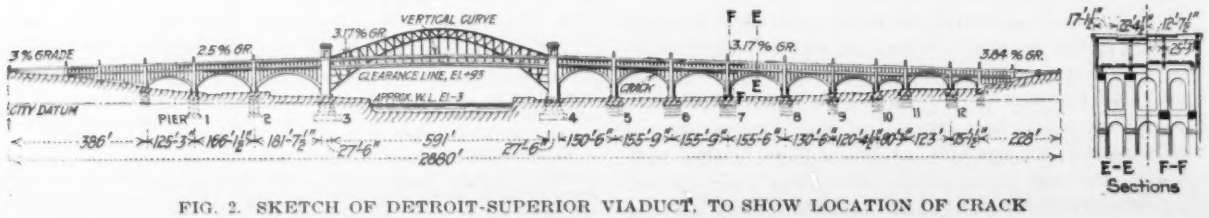


FIG. 2. SKETCH OF DETROIT-SUPERIOR VIADUCT, TO SHOW LOCATION OF CRACK

TABLE SHOWING MOVEMENTS IN PIERS 5, 6 AND 7

Levels on Pier 5

Settlements in feet; the four marks were near base of shaft, El. +6, and the E and W marks were 19 ft. 8 in. apart. Bottom of footing is El. —14.

Date	Loading	SW	SE	NW	NE	Movement to West
Apr. 1, 1915	Pier, El. 6 (since Dec. 7, 1914)	0.005	0.005	0.015	0.007	.....
May 3, 1915	North pedestals El. 53.27, south pedestals av. El. 12	0.008	0.005	0.018	0.010	.....
June 1, 1915	Pier, El. 53.27; span 6, north ribs	0.015	0.015	0.033	0.024	.....
June 15, 1915	Pier, El. 53.27	0.014	0.017	0.042	0.026	.....
Aug. 18, 1915	Span 6, four ribs; span 7, four ribs and columns	.....	.....	.....	.....	0.000
Sept. 4, 1915	Span 7, first deck part done; span 8, ribs and columns	0.031	0.020	0.059	Covered up	.....
Sept. 15, 1915	Span 8, first deck part done	0.035	0.021	0.053	Covered up	0.042
Sept. 27, 1915	Span 7, lower deck done; span 8, lower deck part done	0.034	0.020	0.052	0.032	0.052
Oct. 7, 1915	Span 4, all trusses erected; span 5, nothing; span 6, all ribs; spans 7 and 8, lower deck	0.036	0.022	0.053	0.027	.....
Nov. 17, 1915	Span 4, all trusses erected; span 5, nothing; span 6, all ribs; spans 7 and 8, lower deck	0.044	0.031	0.072	Bolt covered	0.052
Nov. 19, 1915	Span 4, all trusses erected; span 5, nothing; span 6, all ribs; spans 7 and 8, lower deck	0.044	0.031	0.072	Bolt covered	0.062
Nov. 20, 1915	Span 4, all trusses erected; span 5, nothing; span 6, all ribs; spans 7 and 8, lower deck	0.044	0.031	0.072	Bolt covered	0.073
Dec. 16, 1915	Pier to lower deck; center section span 6	0.046	0.031	0.072	Bolt covered	0.073
Mar. 16, 1916	Pier to lower deck; center section span 6	0.059	0.040	0.092	Bolt covered	.....
May 8, 1916	Upper deck span 9, three ribs span 5	0.063	0.048	0.096	Bolt covered	0.073

Levels on Pier 6

Settlements in feet; the four marks were near base of shaft, El. + 7.5, and the E and W marks were 19 ft. 2 in. apart. Bottom of footing is El. —14.

Date	Loading	SW	SE	NW	NE	Movement to West
Apr. 1, 1915	Pier, El. 7.5 (from Dec. 7, 1914)	0.002	0.000	0.006	0.011	.....
May 3, 1915	North half, El. 50.25	0.005	0.006	0.018	0.021	.....
June 1, 1915	Pier, El. 50.25; span 6, north ribs	0.016	0.019	0.028	0.047	.....
July 3, 1915	Pier, El. 50.25; span 5, nothing; span 6, four ribs north outer and inner; two north ribs spans 7 and 8	0.020	0.023	0.032	0.052	.....
Sept. 4, 1915	Pier to first deck; span 5, nothing; span 6, four ribs; span 7, first deck part done; span 8, four ribs and columns	0.053	0.046	0.063	0.070	.....
Sept. 28, 1915	Span 7, lower deck complete	0.061	0.058	0.078	0.069	.....
Nov. 17, 1915	Pier to lower deck; spans 7 and 8, lower deck; center section span 6	0.065	0.059	0.087	0.079	.....
Dec. 16, 1915	Pier to lower deck; spans 7 and 8, lower deck; center section span 6	0.072	0.066	0.086	0.081	.....
Mar. 16, 1916	Lower deck spans 9 and 10 and part of span 6; upper deck span 8	0.081	0.074	0.085	0.091	.....
May 8, 1916	Upper deck, span 9; span 5, three ribs	0.087	0.083	0.104	0.101	.....

Levels on Pier 7

Settlements in feet; the four marks were near base of shaft, El. + 10, and the E and W marks were 18 ft. 5 in. apart. Bottom of footing is El. —14.

Date	Loading	SW	SE	NW	NE	Movement to West
Apr. 7, 1915	Pier, El. 10 (since Dec. 10, 1914)	0.013	0.013	0.016	0.010	.....
June 6, 1915	Pier, El. 48+	0.011	0.015	0.014	0.024	.....
Sept. 4, 1915	Pier to El. 63; ribs on spans 6 and 9; first deck on span 7; ribs and columns on span 8	0.042	0.049	0.051	0.052	.....
Sept. 28, 1915	Pier to lower deck; ribs on span 6; lower deck on span 7 and part of 8; ribs and columns on span 9	0.061	0.064	0.060	0.059	.....
Oct. 5, 1915	Lower deck on all of span 8 and part of span 9	0.058	0.069	0.067	0.063	.....
Oct. 13, 1915	Part lower deck span 9 added	0.068	0.073	0.075	0.076	.....
Nov. 24, 1915	Lower deck span 9 complete, part on span 6	0.079	0.087	0.088	0.089	.....
Dec. 16, 1915	Upper deck on span 8	0.078	0.082	0.089	0.079	.....
July 3, 1916	Upper deck, spans 8, 9 and 10; all lower deck and pier 7	0.098	0.099	0.103	0.102	.....

Pier 5, but Pier 6 now began to move easterly. The accompanying table shows levels taken on the piers during the time in question. These figures, as well as the other data on which the calculations and conclusions are based, were obtained by K. D. Cowen, the county's resident engineer for the Detroit-Superior bridge.

The diagram, Fig. 4, gives equilibrium polygons for conditions resulting from the movements of the piers, as well as the force and equilibrium polygons for dead-load at about the time the crack occurred. In these graphics the bending moment at any point is the product of H times the vertical intercept between its respective equilibrium polygon and the neutral axis of the arch; H is shown positive when it tends to compress the arch rib and negative when it tends to pull it apart.

The values of H and V given are those that would result from the pier movements if the modulus of elasticity of the material remained constant throughout the entire distortive movements. Computations of stresses disclose that for a value of H of about 300,000 lb., the steel in some parts of the rib would be stressed in excess of 60,000 lb. per sq.in. It would thus seem that the values of H and V given on the diagram are very much in excess of those that actually resulted from these movements.

It is not pretended that the stresses given are exact, as this would not be possible; but it is believed that they correctly show the kind of stress, tension or compression, as the case may be, that existed in this region when the crack occurred.

Could Bending Stresses Produce the Crack?

It will be seen by referring to these equilibrium polygons individually as well as collectively that the bending moment is always positive at the place where the crack occurred; that is, the movement is such as to tend to produce tensional stresses at the intrados and compression at the extrados of the arch.

It is true that levels taken June 1, 1915, on the footings of Pier 6, indicate that the northerly end of this pier inclined easterly to quite a considerable extent. As there were no observations between May 27 (the time the rib in question was poured) and June 1, it is not possible to determine what portion of this movement took place before the concrete was set. However, if the movement had been sufficient after the concrete had set to rupture the rib at a place not reinforced, it would have been expected to occur at the lower end of the section containing no reinforcement. Inasmuch as no cracks were observed under close scrutiny, it would seem that rupture did not take place at this time, much less so at the point where the crack later was observed, as this place is almost at the point of contraflexure for inclinations of Pier 6.

The graphics, therefore, do not show any values of H and V for movements easterly of Pier 6, but a westerly inclination only, which was the inclination of this pier about the time that rupture was thought to have occurred.

It was thought, and even claimed by many, that the crack was caused by flexure that produced tension at the extrados, which resulted in a radial crack, and that when the crack reached the pocket of honeycombed concrete it followed along this pocket. This, however, could not have been the case, since, as stated above, all the forces acting on the arch at that place produced compressive stresses at the extrados. Had the crack occurred at the corresponding place on the opposite side of the arch, then it could have been explained as being a tension crack.

It was thought by others that it was a shear crack, a thing that seemed quite plausible except for the difficulty in explaining why any force of such magnitude as to shear the arch for about two-thirds its distance should suddenly cease to exist. In other words, if there had been acting on the arch a shearing force of sufficient magnitude to produce this crack, complete collapse would naturally have been expected.

Besides, the shearing stresses due to the dead-load were very small, even if the honeycombed area were subtracted from the total area of the section along a plane determined by this crack. This stress on the

section, reduced by subtracting the honeycombed area and also reduced by frictional resistance corresponding to 45° friction angle (a value that seems to be substantiated by tests), is a little less than 27 lb. per sq.in.

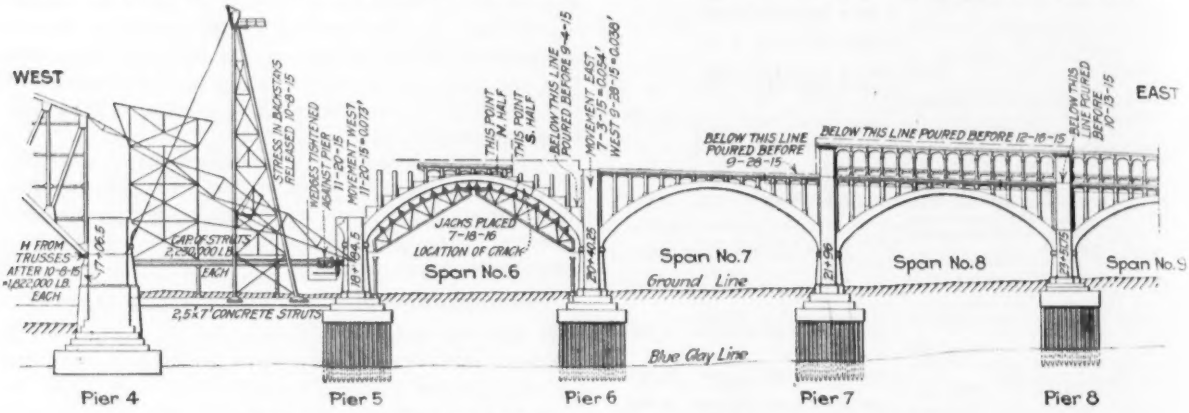


FIG. 3. CONDITION OF ERECTION AND LOADING OF CRACKED ARCH

From numerous tests that have been made it would appear that this is about one-ninth the ultimate strength of concrete of a similar quality. The natural conclusion, therefore, would be that it could not have been a shear crack.

It was suggested by some engineers that the steel struts between Piers 4 and 5 increased the horizontal thrust on the arch rib to a considerable extent, due to expansion caused by change of temperature, and that this thrust, combined with the dead-load thrust, sufficed to shear the arch rib.

Like all elastic bodies, the arch rib would be capable of resisting a thrust like the one produced by the strut in proportion to the amount of deformation, which in this instance would be the change of span caused by the movement of the pier, resulting from the expansive force of the strut against it. Since careful observations disclosed no movements, the movements must have been so small as to be not within the limits of the method employed in making the observations.

By referring to the graphics on the diagram, Fig. 4, it will be found that the arch rib would resist a horizontal movement of the pier of ¾ in. at the springing line of the linear arch by a horizontal thrust of about 300,000 lb. Since the methods employed for observing pier movements were sufficiently accurate to detect a movement of $\frac{1}{16}$ in., the horizontal component resisted by the rib must have been comparatively small—in fact, so small as to be negligible. Since the concrete, with the exception of the honeycombed section, was of excellent quality, it is plain that the crack could not have been caused by this small stress.

Influence of the Honeycombed Spot

Reference to the diagram will show that there is no reinforcing steel at this portion of the arch where the crack occurred. Engineers generally expressed as their opinion that, had there been steel placed at this section, the crack would not have taken place. The writer, however, contended from the first that such was not the case and accordingly sought for some other cause.

The only cause that seemed at all probable was that the honeycomb had been formed by an excess of water in the concrete at the time of pouring, and the material, being improperly worked, did not allow the water to escape. This portion, being completely surrounded by concrete of good quality that permitted no evaporation

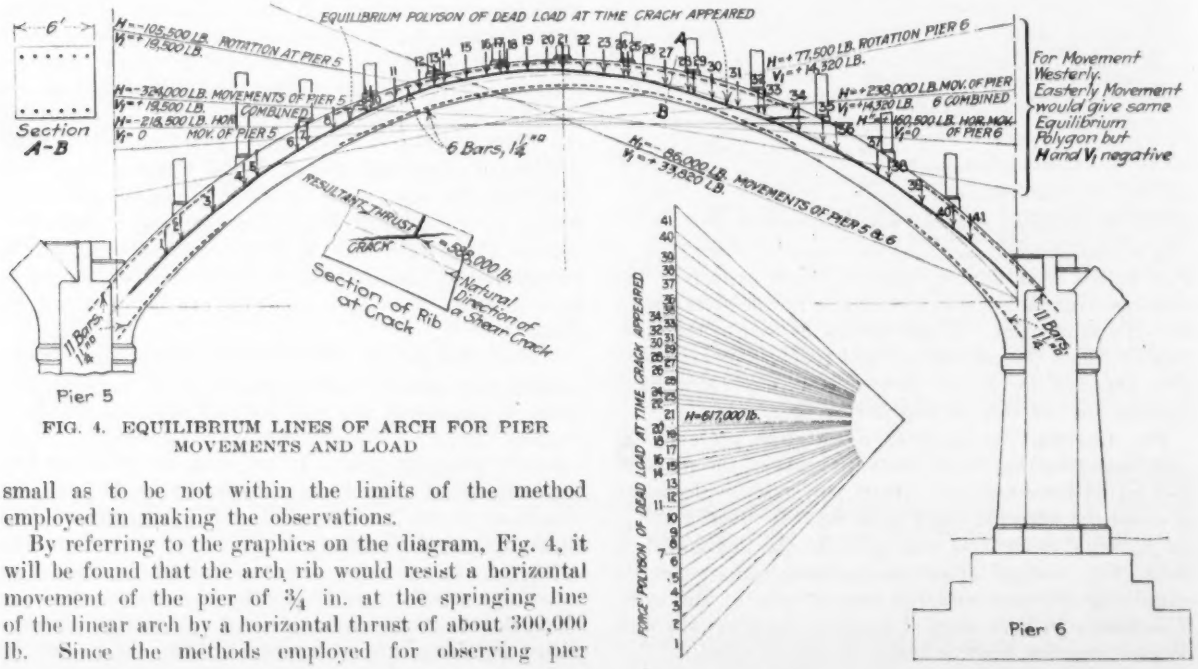

EQUILIBRIUM POLYGON OF DEAD LOAD AT TIME CRACK APPEARED
H=-105,500 LB. V1=+19,500 LB. ROTATION AT PIER 5
H=-324,000 LB. MOVEMENTS OF PIER 5 V1=+19,500 LB. COMBINED
H=-218,500 LB. HOR. MOV. OF PIER 5 V1=0
H=+77,500 LB. ROTATION PIER 6 V1=+14,320 LB.
H=+238,000 LB. MOV. OF PIER V1=+14,320 LB. 6 COMBINED
H=+160,500 LB. HOR. MOV. OF PIER 6 V1=0
H=-86,000 LB. V1=+33,820 LB. MOVEMENTS OF PIER 5 & 6
For Movement Westerly. Easterly Movement would give same Equilibrium Polygon but H and V1 negative
6 Bars, 1¼"ø
RESULTANT THRUST
CRACK
=588,000 lb.
Natural Direction of a Shear Crack
Section of Rib at Crack
11 Bars 1¼"ø
Section A-B
Pier 5
FORCE POLYGON OF DEAD LOAD AT TIME CRACK APPEARED
H=617,000 lb.
Pier 6

FIG. 4. EQUILIBRIUM LINES OF ARCH FOR PIER MOVEMENTS AND LOAD

of the water, remained so imprisoned until severe weather, when the extreme cold penetrated to the liquid, froze it and caused the crack.

The time that elapsed from the pouring of the concrete until its probable freezing was about eight months. While this may seem an unusually long period, it is the opinion of the writer that the above-mentioned condition was entirely possible, on account of the fact that the air which naturally had to replace the water would be obliged to enter through the same pores occupied by the water in evaporating.

The water was situated nearly in the center of the arch rib, at a distance of from 2 to 3 ft. from the surface, and considerable time necessarily elapsed before the cold penetrated to it. It was therefore natural that the time of freezing should occur long after the beginning of the intense cold, which last year started in February. However, though the crack was first observed May 1, 1916, it probably occurred much earlier, as considerable time must have elapsed before the heat penetrated to the frozen pocket of water; but it could be seen only after the liquid began to ooze out, discoloring the surface.

A Parallel Case of Water in a Honeycomb

The writer's original opinion was further strengthened by an account of a parallel case given by one of the engineers of the Nickel Plate R.R., covering the construction of a mass concrete arch in grade-crossing work. In this case, after the structure was built, the water found an opening and escaped in considerable quantities—to such an extent, in fact, that it was thought to have come from some external source. In this instance also, upon cutting into the concrete, a large pocket of honeycombed concrete was discovered, showing that it is quite possible for pockets of water of considerable size to be formed during the pouring of concrete and for the water to remain imprisoned for some time before evaporating.

Referring to the sketches of the arch, it would not be difficult to conceive that, if a wedge were driven into the arch at the intersection of the horizontal and radial cracks, there would be produced a crack very like the one that actually occurred.

While the center of the honeycombed pocket is not directly at the intersection of the cracks, but situated a little farther toward the crown, the radial crack could not be expected to occur at the center of this pocket, because the steel at the extrados extending beyond the center of the pocket prevented the crack from occurring at this point; and it therefore took place just at the end of the steel.

Summary

Since the crack could not have been a tension crack (there being no tension at that point) nor a shear crack (because the shearing stress was very low), since the crack occurred at the end of protracted cold weather and since upon the arrival of warmer weather a considerable amount of liquid emerged from the crack, the writer was obliged to conclude that the pocket must have been full of water, that the water froze and that this freezing split the arch rib. Also, his opinion was strengthened by a similar occurrence called to his attention by another engineer, and in his mind there is little doubt of its being the true conclusion.

Chicago Garbage-Reduction Costs

The garbage-reduction plant now operated by the City of Chicago was taken over from a private company in 1914 and has been altered and improved considerably under the direction of Henry A. Allen, consulting engineer to the city, and head of the Waste-Disposal Bureau in the Department of Public Works. In a paper read by Mr. Allen before the Chicago section of the American Society of Mechanical Enginers, it was shown that the cost of treatment has been reduced materially and a net revenue (really an "operating profit") is expected from operation during 1917.

As to the cost of the plant, the city purchased it from the Chicago Reduction Co. for $275,000. This purchase was largely on account of its value as a "temporary utility," there being no time to secure a site and erect a new plant before the approaching hot weather. At the same time, it put a stop to litigation and controversy.

For the five years, 1909-13, prior to the acquisition of the plant by the city, the city paid the company $47,500 per year, the cost per ton averaging 42c. and ranging from 52.8c. in 1909 to 32.9c. in 1913, owing to the steady increase in quantity of garbage (from 89,957 tons to 144,343 tons). For the first two years of municipal operation (1914 and 1915) the operating cost (no capital charges included) was 76.8c. and 63.2c., this increase in cost being due to the reconstruction of the plant. For 1916, the corresponding cost was only 16.1c., and for 1917 an operating profit of 86.9c. per ton is expected, but again no allowance for capital charges is made. The figures of quantity and cost are given in the accompanying table. The cost of operation includes repairs.

It is estimated that about 150,000 tons of garbage will be delivered in 1917 and will produce 4000 tons of grease and 30,000 tons of tankage. The city has contracts for the sale of the grease at 7.29c. per lb. and the tankage at $4.16 per ton. Mr. Allen states that the former price is high, while the latter is low, the present market value of garbage tankage exceeding $7 per ton.

OPERATING COSTS OF GARBAGE REDUCTION AT CHICAGO

(Capital Charges Not Included)

	1914	1915	1916	1917 (Est.)
Operating cost	$154,684	$278,570	$432,721	$477,000
Revenue	96,585	183,197	410,512	603,000
Net operation	$8,099	95,372	22,209	
Net revenue	.....	.....	.....	126,000
Garbage, tons	75,600	150,875	137,920	145,000
Net cost per ton	$0.768	$0.632	$0.161	
Net profit per ton	.....	.....	.....	$0.869

NOTE.—In the estimate for 1917, the price of grease has been taken at 5c. per lb. and tankage at $5 per ton, both figures much below the present market prices. During 1916 the extractor plant was in operation only from June 1, and the millhouse was not in full operation until the latter part of June. From Jan. 1, to time of starting the extractor plant, the city received only $3.27 a ton for commercially dried garbage, which is green garbage dried down to 10% moisture. The capacity of the old millhouse was not sufficient to handle all garbage degreased, necessitating the storage of approximately 14,000 tons on the property north of the plant, thereby greatly increasing the cost of production of tankage.

Transporting 3000 Tons of Machinery 240 Mi.—Transporting the heavy machinery for the new smelting works of the Atbasar mines of the Spassky Copper Co. in Siberia necessitated laying sections of track from the Trans-Siberian Ry. depot to the smelting works. This distance is 240 mi. and the method employed was to lay about 10 mi. of 35-lb. rail. The equipment was moved this distance, when the track was picked up and laid ahead. The main difficulties were those connected with the climate and the war, says the "Engineering and Mining Journal." Work is possible only 6 mo. of a year and labor (Khirgese tribesmen) is not dependable. The train method was adopted for moving the machinery because the soft roads will not support very heavy trucks—3 tons being the limiting load on a wagon for successful haulage.

Notes from Field and Office

New type of universal calculating machine—Wide concrete pavement with top reinforcement Accurate construction drawings—Effect on concrete of water and time of mixing

Survey Computations with a Monroe Calculating Machine

The distinctive feature of the Monroe calculating machine is a combination of a standard flexible adding-machine keyboard with a reversible arithmometer and a sliding carriage. It performs addition, subtraction, multiplication and division, or a combination of these operations. It is this combination of adding and computing machine that makes the device particularly useful in engineering offices, where most computations involve all operations simultaneously.

For adding, the successive numbers are set on the keyboard by pressing down the proper keys, and successive forward turns are given the crank (see Fig. 1), the sum appearing in the lower of the two rows of dials on the sliding carriage. For subtraction the larger number is set on the keyboard, and one forward turn registers it on the lower row of dials; to subtract any number from this the number is first set on the keyboard, and then one backward

FIG. 1. MONROE COMPUTING MACHINE, SHOWING METHODS OF MANIPULATION

turn of the crank gives the result in the lower row of dials, as before.

In multiplication the multiplicand is set on the keyboard, and the multiplication is performed by forward turns of the crank, the number of turns being the sum of the digits of the multiplier. For instance, to multiply by 122 the crank is turned once, a shift of the carriage made and then two turns, another shift and two more turns, making five turns in all. The result appears in the lower row of dials and the multiplier in the upper row. To perform division the dividend is registered on the lower dial and the divisor on the keyboard; then the previous process is reversed, as in subtraction, the quotient appearing in the upper row of dials. Square and cube roots may also be computed on the machine.

The application to extended computations is best illustrated by reference to Fig. 2, which represents the plat of a survey of nine lots. Starting at x, the course xl = 144.34 ft. is set on the keyboard by depressing the

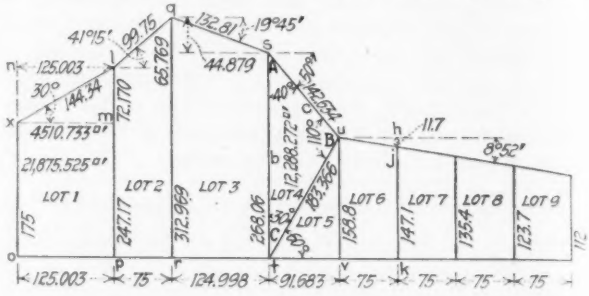


FIG. 2. SURVEY PLAT TO ILLUSTRATE USE OF COMPUTING MACHINE

proper keys. Then by five forward turns of the crank we have multiplied 144.34 by the sine (0.5) of the given angle (30°); the result (72.170), appearing on the lower dials, is the value of the coördinate lm. The sine, appearing on the upper dials, serves as a check.

Now clear the dials by forward and backward turns of the clear-out crank (see Fig. 1) and, the setting of the keyboard remaining unchanged, multiply by the cosine (0.86603) of the angle (30°), 12 forward turns, to obtain the value (125.003) of the coördinate ln.

Obtain the area of the triangle xlm by the formula $\text{area} = \frac{bc}{2}$, which gives $\frac{125.003 \times 72.17}{2} = \frac{9021.46651}{2} =$ 4510.733 sq.ft. which is done by 15 turns of the crank. The area of the rectangular section of Lot 1 may be computed and added to the area of the triangular section by leaving 4510.733 on the lower dials and multiplying 125.003 by 175, the number 125.003 having been left on the keyboard after the previous step. The lower dials will then show the sum of the areas computed in the last two steps, which is 26,386.258 sq.ft., the total area of Lot 1. The areas of Lots 2 and 3 may be obtained by the same process as is used for Lot 1.

With xo given, we have $175 + 72.17 = 247.17 = lp$; $lp + 65.769 = 312.939 = qr$; $qr - 44.879 = 268.06 = st$; these are the lengths of the next three vertical lines obtained by three forward and one backward turn of the crank.

Lot 4 presents the solution of an oblique-angled triangle with the three sides given:

$$\cos A = \frac{c^2 + b^2 - a^2}{2bc} = \frac{142.634^2 + 268.06^2 - 183.366^2}{2 \times 268.06 \times 142.634}$$

$$\frac{20{,}344.458 + 71{,}856.164 - 33{,}623.090}{76{,}468.94} = \frac{58{,}577.532}{76{,}468.94}$$

$$= 0.76603 = \cos 40°$$

$$Sin\ C = \frac{c \sin A}{a} = \frac{142.634 \times 0.64279}{183.366} = \frac{91.6837}{183.366}$$

$$= 0.500 = sin\ 30°$$

$$B = 180° - (A + C) = 110°$$

$$Area = \frac{a \times b \times sin\ C}{2} = \frac{183.366 \times 268.06 \times 0.5}{2}$$

$$= \frac{24,576.545}{2} = 12,288.272\ sq.ft.$$

In Lot 5 we have:

$$ux = hypotenuse \times sin\ 60° = 183.366 \times 0.86603 = 158.8$$

$$ty = hypotenuse \times cos\ 60° = 183.366 \times 0.5 = 91.683$$

Both multiplications are made with one setting of the keyboard.

The coördinate $jh = 75 \times \tan 8°\ 52' = 75 \times 0.156 = 11.7$, making the boundary $jk = 158.8 - 11.7 = 147.1$; and as each succeeding boundary is 11.7 less than the one preceding it, this subtraction leaves the keyboard and dials set so that each successive backward turn of the crank will cause the lower dials to show the length of the succeeding line.

Angles may be added by using the first two rows of keys for the minutes and the fourth, fifth and sixth for degrees, the third row serving to separate the groups and provide an extra place when the number of minutes totals 100 or more.

The numbers are set and added; the result appears in the lower dials as a continuous line of figures; but as degrees and minutes are sexagesimal quantities, the minutes must be reduced to degrees and added to the degrees column. This may be accomplished by dividing the total number of minutes by 60, the number of degrees and minutes being represented by the quotient and remainder respectively. Both these operations may be performed simultaneously by depressing the 9 in the third row of keys and the 4 in the second row of keys and adding this complement until 0 appears in the hundreds' place and less than 6 in the tens' place, when the result dials will show the correct number of degrees and minutes of the total. By this method it is necessary to watch the minutes' group and make the reduction as often as necessary to prevent the total number of minutes occupying more than three places. This reduction can be made as often as desired without disturbing the degrees' group.

The Monroe calculating-adding machine is manufactured by the Monroe Calculating Machine Co. at its plant in Orange, N. J. The price of the machine is $250. The general offices of the company are in the Woolworth Building, New York City.

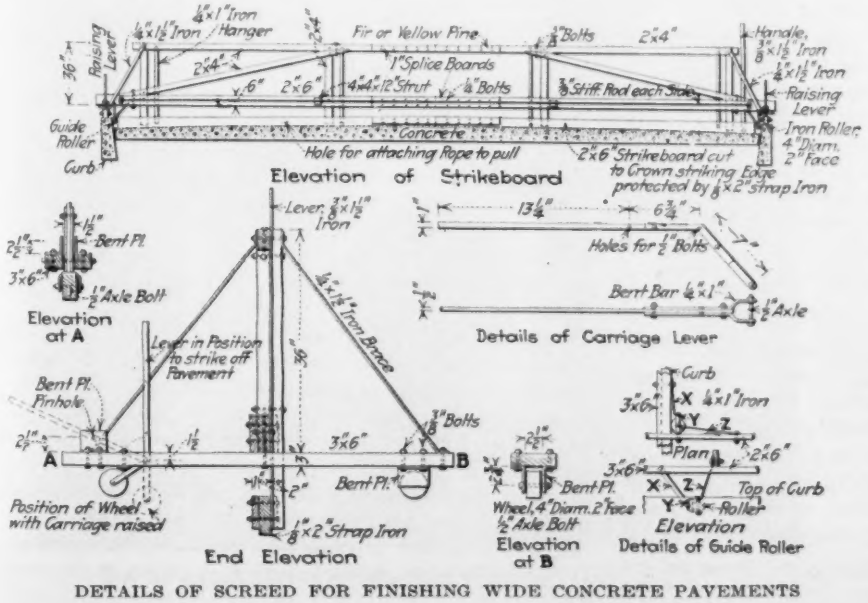
Constructing Wide Concrete Pavements with Top Reinforcement

By Charles A. Alderman*

Concrete paving of unusual width was constructed in Depew, N. Y., a suburb of Buffalo, during the past year. Six streets were paved, aggregating 28,000 sq.yd. Four of these streets were paved 40 ft. wide, and only parts of two of the streets had car tracks, so that most of the pavement was laid in one continuous slab for the full width from curb to curb. Transverse expansion joints ¼ in. wide, at intervals of 36 ft., and longitudinal joints of the same width along either curb were made of "Genasco," an asphaltic composition.

The pavement is 8 in. thick in the center and 6 in. at the sides. Its surface is shaped to a hyperbolic curve for the middle half-width of the street and to a straight line thence to the gutters, which are 6 in. below the center line. This hyperbolic cross-section is one that was adopted by the New York State Highway Department in 1916 for pavements 20 ft. or more in width.

Reinforcement was placed 2 in. beneath the finished surface. The cross-sectional area of the reinforcing metal running parallel to the center line of the pavement is 0.038 sq.in. per ft., and the cross-sectional area perpendicular to the center line is 0.049 sq.in. per ft. The reinforcing metal extends to within 2 in. of all joints, but does not cross them. Adjacent widths of fabric are lapped 4 in. when perpendicular to the center line of pavement and 1 ft. when parallel to the center line. Reinforcement of the same cross-section as above was placed 2 in. from the bottom of the slab over all new trench backfills, extending 2 ft. on each side. The screed used in finishing the pavement was substantially the same as that designed by the Universal Portland Cement Co. (see accompanying illustration). This screed was made of seasoned lumber, in order to have it as light as possible. It was pulled forward by four men. Too much care and attention cannot be given to detail in the design and construction of a screed, for upon its



DETAILS OF SCREED FOR FINISHING WIDE CONCRETE PAVEMENTS

*Civil Engineer, 575 Ellicott Square, Buffalo, N. Y.

operation the ultimate success of the paving depends. The screed should be made very rigid, so that it will not leave any depressions or humps in the surface.

When the longitudinal street grades were steep, no particular trouble was encountered in getting a satisfactory surface, but where the minimum grade of 0.4% was used, it was found very difficult to get an even, uniform surface, particularly at the gutters. The writer would recommend that in the construction of pavements as wide as 40 ft. the screed be made extra heavy in order that it hug the paving surface more closely.

Brooming of the concrete surface was carried on by means of a heavy broom that was drawn back and forth across the concrete surface by two ropes. Wherever stones appeared on the surface as a result of the brooming they were removed from a finishing bridge spanning the roadway.

The concrete was mixed 1 : 1½ : 3. The fine aggregate consisted of natural sand or screenings that, when dry, would pass a sieve having four meshes per linear inch; not more than 25% was allowed to pass a sieve having 50 meshes per linear inch, and not more than 5% a sieve having 100 meshes per linear inch. The fine aggregate contained less than 3% loam or vegetable matter. The coarse aggregate was such as to pass a 1½-in. round opening and ranged in size from 1½ in. down, not more than 5% passing a screen having four meshes per linear inch.

No cracks have appeared in the pavement to date. The work was begun in May and completed in October by the Harrison Engineering and Construction Corporation, of Buffalo, N. Y. George C. Diehl, Consulting Engineer, of Buffalo, was village engineer, the writer having charge of the work for Mr. Diehl.

Final Building Plans Should Show Actual Construction

By Albert M. Wolf*

Not only is it important to have well-made and complete plans as a guide in the construction of concrete buildings, but it is equally desirable from the standpoint of the owner and his future architect or engineer to have an exact record, available at any time, of the actual construction. Some may think that the minor changes made in certain portions of a building during construction are inconsequential, but after one or two experiences in making extensions or repairs to a building—the final drawings of which are not true records of the actual construction—they will perceive many reasons for this precaution. To depend on the memory of the superintendent for information on changes in construction is as poor business policy as trying to keep large accounts on loose scraps of paper.

Changes in details of foundation and substructure work during the process of construction are more common than in other parts of a building, owing to inability to obtain an exact survey of the foundation soil beforehand. The same is true of service tunnels, trenches and the various underground pipe lines required in a building. If the exact location of these utilities and the character of the changes made are correctly recorded on the final plans, new underground work, machinery foundations and building extensions can be readily laid out in the drafting room without resort to costly surveys or the use of erroneous plans.

Equally important is the recording of changes in construction of the framework of a building or the inclosing walls, interior partitions, etc.—for when an owner desires changes or additions to the layout of his building, the architect or engineer should be able to make up the necessary plans or the desired reports without going to the expense of making careful surveys of existing conditions. Nothing is more exasperating than to design the foundations of an extension to an old building, or of a new one adjacent to an existing structure, and to find on excavating for the new work that the old foundations were carried down much farther than the plans indicated. The result is rush work on revisions, and heavy bills of extras to the owner, which are unjustifiable from the standpoint of the designer of the existing building. The architect or engineer in charge of the later work has a right to assume that his predecessor served his client's interests scrupulously. If this were not the case, plans would be of little value for future reference.

It is the writer's practice to furnish the superintendent on the job with a set of blueprints of the detail construction drawings. Upon these prints he is instructed to indicate in ink all field revisions and additions. When the job is completed, this set of plans is turned in to the home office, where the changes are made on the record tracings. Care is taken to note these with dates in the space allotted for this purpose. Then the tracing is marked: "Final Revision To Show Actual Construction." A set of prints is furnished the owner for his reference, and another set is filed with the contract set of plans, while copies of the construction prints and the superintendent's record set are issued. That this little extra expenditure on drawings pays, goes without saying.

*Principal Assistant Engineer, Condron Co., Industrial and Structural Engineers, Chicago.

Deep Open Trenching for a 72-In. Reinforced-Concrete Pipe

(Contributed)

In connection with the construction of a 72-in. water-supply intake main for the Solvay Process Co., Syracuse, N. Y., some very difficult open-trench work was necessary. The intake main extends 1250 ft. out into Lake Onondaga from a reinforced-concrete well on shore.

From the intake well for a distance of 1350 ft. a 72-in. reinforced-concrete pipe was constructed in place. Landward of the well the pipe passes through a tunnel to the large sump in the new pumphouse of the Solvay Process Co. Much difficulty was encountered in digging the trench and keeping it open, on account of its great depth, 38.5 ft.

On each side of the trench was driven 45-ft. Lackawanna steel sheetpiling, strutted with braces 8 ft. apart between longitudinal waling placed every 6 ft. vertically. Even with this quantity of bracing it was common to see a brace indented into the waling timbers at least 1 in., and a great many of the braces buckled and broke, owing to the enormous pressure. This trench passed through what is known as the "waste bed." The material, which consists of waste lime products from the Solvay plant, is of a plastic nature that causes it to exert

a greater pressure than any other material that the writer has ever seen. This was especially the case after a heavy rain.

Beneath this material and about 7 ft. above grade, there was from 3 to 4 ft. of black muck overlying several feet of marl, quicksand and silt. As soon as the marl was dug away and the sand encountered, it would start flowing into the trench from the surrounding territory, the heavy weight of the waste bed on top forcing it down, carrying the steel sheeting with it. Great difficulty was experienced in keeping the sheeting near a level where it would serve its purpose. The settlement of the sheeting would of course disarrange the braces so that it was necessary practically to double the bracing.

When grade was obtained in the open trench, piles varying from 25 to 45 ft. were driven in the bottom, on which were placed 12x12-in. caps and a 4-in. yellow-pine floor. As an indication of the character of the bottom it may be said that some of the 45-ft. piles were driven to grade with practically the weight of the hammer.

After the piles were in place, caps and grillage on, it was necessary to brace from the longitudinals down to the top of the floor to keep it from rising up, and in several instances it did rise at least a foot, making it necessary to drive the flooring down again and brace it. So in addition to the large amount of bracing required for the sidewalls, it was necessary to brace the floor throughout in order to hold it in its position after it was completed and ready for the forms.

The forms and reinforcement were placed and the concrete deposited, making a 72-in. reinforced-concrete pipe with 15-in. walls. The reinforcement used was 3-in. triangular mesh, American Steel and Wire Co. type, made up in 5-ft. sections, and each section was laid overlapping the next by 3 in. As the concrete pipe was completed, the trench behind was filled in with cinders and other material, after which the sheeting was pulled and redriven to form another section of trench.

The many and extraordinary difficulties met with on this job and the great depth of open trench made the progress much slower than anticipated. The concrete used in the pipe line was a 1:2:4 mix with limestone from the Jamesville quarry. The work was done by the Great Lakes Dredge and Dock Co., of Buffalo, N. Y., for which company the writer is division engineer.

VIEW OF SYRACUSE TRENCH, SHOWING SECTION OF 72-IN. PIPE

Effect of Water and of Time of Mixing on Concrete Strength

The testing laboratory of the Public Service Commission, State of New York, has conducted field and office experiments on concrete ever since the starting of the new New York City subways some five years ago. As a result it has accumulated many data on the behavior of concrete, some of which were outlined by J. G. Steinle, Assistant Engineer of the commission, at the recent convention of the American Concrete Institute. In regard to two very timely factors, the amount of water and the duration of mixing, Mr. Steinle had the following to say:

Effect of Consistency on Concrete

The result of testing a large number of concrete cylinders made in the field seems to indicate that, next to the cement, the most important factors affecting the strength of the concrete are the field conditions under which it is made. Of these factors the consistency of the mix perhaps causes the greatest variations in the strength, especially on specimens tested up to 28 days. In spite of the fact that the test cylinders show that concrete of wet consistency possesses a low compressive strength, it is at times necessary on subway work to use wet mixtures on account of the difficulty of passing it through chutes and because of complicated forms and reinforcements. The effect of an excess of water is to swell the volume and reduce the density. In an excessively wet mixture there will be more or less separation of materials, and concrete of uniform quality will not ordinarily be produced. An excess of water will also interfere with the chemical reaction of the cement and cause the concrete to become both slow setting and slow hardening. Field tests show that a concrete of a quaking consistency will give the best results. It will also be observed that, whereas a concrete of very wet consistency when sampled and tested in the usual way will show low results, the *same concrete* when cut from the structure will not show the same relative weakness. This may be partly explained by the fact that a large part of the water and lighter particles, in actual practice, rise to the top of the form and are not confined in the mass of concrete. The effect of the time of mixing of concrete on its compressive strength cannot be well established from data obtained from field tests, as most of the specimens are taken from the forms and not directly from the mixer. The total mixing of the concrete is made up in part by that received in the mixer and in part by passing through chutes, rehandling, etc. The actual effect of the treatment in the mixer on the strength of the specimen made in this way is partly lost. The fol-

lowing tests, made on concrete mixed for 1 min., 30 sec. and 10 sec. and then passed through long chutes will illustrate this point:

Test No.	Time Mixed, Sec.	Age, Days	Consistency	Ultimate Strength, Lb. per Sq.In.
1	10	7	Wet	1,268
2	30	7	Wet	996
3	60	7	Wet	1,144

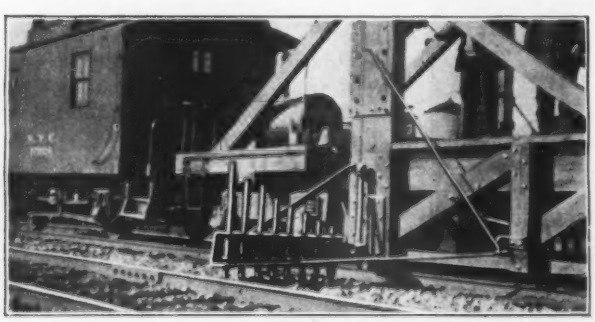
The best and most uniform test results have been obtained on concrete mixed for at least one minute after all the ingredients had been added. Thorough mixing will remove films of air adhering to particles and will reduce the amount of air confined in the mix; it will also increase the fluidity of the mix and thereby reduce the amount of water required. Test specimens, which show low compressive strength, usually fail because of the breaking of the bond between the mortar and the coarse aggregate. The certainty of securing a bond between the broken stone or gravel and the mortar is greatly increased by continued mechanical mixing, as a film of silt or a coating of stone dust enveloping the larger particles is removed and a cleaned surface is exposed to the mortar. This could not be easily accomplished by hand mixing and may account for the prejudice against the use of gravel before the introduction of machine mixing.

The speed at which a mixer is run does not necessarily govern the time required to secure a proper mix, as it has been observed that when a mixer runs fast the concrete has a tendency to cling to its sides and does not travel properly through all machines. A uniform gray color of the mix does not necessarily establish the fact that it has received sufficient mixing.

FINE AGGREGATE

Rapid Progress in Tunnel Lining by the pneumatic process is being made in the Wilson Ave. tunnel for the Chicago water-supply system. During January one outfit mixed and placed concrete in three 30-ft. lengths of forms daily, and on two consecutive days four forms were completed. These 30-ft. forms contain an average of 2 yd. of concrete per lineal foot. The men have been working two 8-hr. shifts. Four concreting outfits are in use, but the work mentioned represents that of one outfit. The pneumatic equipment was furnished by the Concrete Mixing and Placing Co., of Chicago. The tunnel is about 8 mi. long and is 12 ft. in diameter. It is being built by day labor under the direction of John Ericson, City Engineer, and Henry W. Clausen, Engineer of Water-Works Construction, as described in "Engineering News," May 25, 1916.

Ballast-Cleaning Device—On the New York Central R.R. there is considerable trouble caused by grain dropping from cars and growing in the stone ballast. An excessive amount of work by the trackmen is required to keep down the growth, and the device shown herewith has been invented to eliminate this handwork. It consists of arms or wings, attached to the posts of a spreader car, each carrying a row of vertical rods or teeth. These rods are graduated in length to conform to the contour of the outside shoulder of the ballast, and a small blade on the extreme end of the outside wing keeps the ballast in its original shape. The car is run at a speed of about 6 mi. per hr., and one trip is sufficient to clean and trim the ballast. It not only cleans out all vegetation, but causes the fine stuff and dirt to settle to the bottom of the ballast so that weeds and grain are less likely to grow. This device is the invention of A. M. Clough, Supervisor of Track, New York Central Lines, Batavia, N. Y.



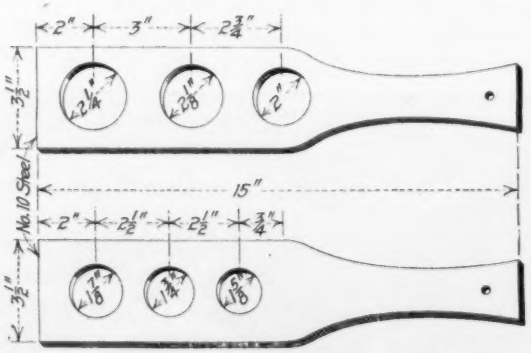
BALLAST-CLEANING DEVICE; NEW YORK CENTRAL R.R.

A Method of Numbering Highway Bridges and culverts to provide standardization throughout the different counties in designating the various structures and to afford an accurate basis for complete and authentic office records has been adopted by the Ohio State Highway Commission. According to Le Roy W. Allison, this plan, now in effect in Hardin County, consists in stenciling the numbers in the concrete

HOW STATE HIGHWAY BRIDGES AND CULVERTS ARE NUMBERED IN OHIO

before the latter has set, each road foreman being supplied with uniform numeral stencils. The number is pressed in a conspicuous place and is clearly legible, as indicated in the illustration. This plan makes it easy for roadworking crews and foremen to locate a particular structure. It is also convenient for people using the highways.

A Hand Gage for Drill Bits is used in the steel-sharpening shop of the Wisconsin Zinc Co. mines near Platteville, Wis. J. E. O'Rourke—whose drill-sharpening article won first prize



HAND GAGE FOR ROCK-DRILL BITS

in the recent "Engineering News" prize contest—states that this gage can be used to good advantage by a novice on the sharpener in checking his steels, until he becomes familiar with the machine.

Exhaust Steam to Heat Concrete Water—Where steam-driven concrete-mixing plants are used a supply of hot water for mixing purposes can be had without extra expense for fuel by utilizing the exhaust steam for heating the water, passing this exhaust through a coil hot-water heater in a manner similar to boiler-plant practice. Around the coils is passed the water on its way to the mixer. The exhaust, for each horsepower of engine, should heat up to 180° F. or higher about 180 lb. of water. In the heater coils about ¼ sq.ft. of heating surface should be provided for every 30 lb. per min. of water to be heated.—W. A. Tayler, 3634 North 12th St., Philadelphia.

Editorials

For close to half a century, the civil engineering profession in the United States has been served by two journals, *Engineering News* and the *Engineering Record*, occupying practically the same field. The publishers announce on the front cover of this issue the completion of arrangements for the consolidation of these two journals as the *Engineering News-Record*, the first issue of which will appear on April 5. This consolidation is made possible as one result of the amalgamation of the two publishing companies, the Hill Publishing Co. and the McGraw Publishing Co., which are to be reorganized as the McGraw-Hill Publishing Co., and will continue the publication of the consolidated journal and the other nine technical journals heretofore issued by the separate companies.

The *Engineering News-Record* will have the advantage of an enlarged editorial staff and the combined experience and ability of the organizations which have hitherto produced the two separate journals. A larger and better journal and a higher quality of service to the engineering profession of the United States are the results which may be confidently expected to grow out of this consolidation.

Subscribers to either of the two journals will receive the consolidated journal after April 5 and those subscribing to both journals will have their subscriptions extended for a period equal to the sum of the times for which advance payment has been made.

Milestones in Engineering Practice

A timely commentary on the need for engineering journals and engineering societies is made by noting how few engineers around the country (in peace times we would have said around the world) are aware of the recent completion of what is, for the moment, the greatest drainage reclamation project and the greatest drainage pumping station—the Mattamuskeet district and the New Holland station. The notes that appear elsewhere in this issue on the district and the station well typify that endless series of technical reports from the editors to the readers, each made during a personal inspection and a careful study of the problems and their solutions—in an endeavor to carry our thousands of readers to those out-of-the-way spots, and to render accessible to the many the transferable elements in the experience of the few.

The handful of men in the country who have become familiar with the Mattamuskeet work speak of it as the "greatest" project and the "greatest" station. The justification of these adjectives here, as in dozens of previous cases, becomes a matter of definition. It is not difficult to fix a place for this piece of work in the drainage reclamation projects of this country or Europe. In acreage served by a single system of canals, and in area of virgin reclaimed land, Mattamuskeet appears to be the largest piece of American work, its 100,000 (total) and 50,000 (reclaimed) acres towering above the 27,000-acre Neches Canal district in Texas, or the 66,000-acre Sutter Basin district in California. But, of course, the Mattamuskeet project is not as large as some of the advertised chains of smaller single projects—for example, the 100,000-acre holdings of the Louisiana Meadows Co.

Louisiana has only 250,000 acres of reclaimed land. Practically all the bottomlands along the Illinois River have been recovered and they constitute a total of 182,000 acres. On the Mississippi River between Muscatine and St. Louis there are some 340,000 acres reclaimed. The Great Haarlem Lake in Holland has only 42,000 acres. The southern Zuyder Zee project will reclaim 500,000 acres, and it will have 15 steam plants of 17,000 hp. combined. The entire fens of Eastern England have only about 360,000 acres in all—only about 125,000 acres being drained by steam pumps in 13 districts having 800 to 35,000 acres each.

The New Holland station with its four 850-hp. 560-sec.ft. 10½-ft. steam units itself must be compared with that of the Sutter Basin electric plant with its six 800-hp. 175-sec.ft. 29-ft. units, the latter station being greater in horsepower capacity, but much smaller in volume of delivery.

After all, such questions of size are only of passing moment compared with the engineering work as it may prominently illustrate the trend of engineering development and constitute a milestone to which we may carry forward comparisons out of past history or look back to in future years. The Mattamuskeet plant is a milestone in that it exemplifies most interestingly the business side of engineering; there was not merely a task to be done, but one to be done with perpetually the least overall annual expenditure and with the greatest insurance of continuity of service. How both aims were embodied suggests itself from an examination of the plans on another page—in the substantial foundations and substructure, fireproof long-lived superstructure, high-class machinery, modern forms of intake and discharges, and in adequate hydraulic and power capacity. These features are in great contrast, each and all, with most of the early drainage plants in America. The evidences of that higher economy which marks the commercial imprint on engineering design is seen even in the details. For instance, in the pumps, of unparalleled output for centrifugal units, the development expense is kept low by employing four parallel stages each of a size well within the limits of extensive experience and involving no untried elements, no huge new patterns or castings. The stages are combined so that, without expensive valves

or complications, each unit can give service with one, two, or three quarters of the pump and half the engine, should contingency arise.

Truly such plants deserve to be recorded as milestones of our progress; and the editors are justified occasionally in reminding the readers that the searching out of such cases is one of the most important tasks to which the coöperation of all is invited.

A Tragedy of Errors

Once more a structure in which the safety factor has proved to be less than unity serves as an impressive exhibit of how not to build. There were so many things wrong with the construction of the Post St. bridge at Spokane, which collapsed on Feb. 7, as described in detail in *Engineering News* last week, that noting them would seem superfluous had not the accident occurred in a progressive city under engineering auspices which seemed beforehand to be of the best, and far above the need of elementary instruction in structural methods. That such an accident can happen only goes to show how persistent must be the reiteration of fundamentals.

The faulty construction of the centering which failed to support the 250-ft. concrete arch is the most obvious and spectacular feature of the catastrophe. This structure was about as far from safe as it could well be and stand up at all. Passing over the evident lightness of the designed framing as a dangerous but not necessarily fatal defect, one may note three details in which the construction of the centers falls short of safety—the insecure footing of the piles, the substitution of spikes and toenails for the usual bolted or framed joints in the timbering and the use of two 4 x 8's spiked together for the required 8 x 8-in. posts. Of these, probably the first was the primary cause of collapse but the second made sure a complete failure once high water, drift or current had undermined one or more of the pile footings, or once the structure was subjected to any twisting strain. An inspection of the close-up view and the sketch details of the falsework, shown in these columns last week, is informing. How any competent constructor could permit such cobhouse blocking, insecurely held supports and profuse shimming is past comprehension, particularly when it is remembered that only a few years ago the Post St. bridge would have been the longest span concrete arch on record. For an arch of one-tenth the span good practice would have condemned falsework so constructed.

But, engineers will ask, how does it happen that such laxness was possible in a large municipal structure? There are some pertinent facts which such questioners should know. In the first place, the contract was let to the lowest bidder on proof of his financial stability and with no regard for his experience in this class of work. This experience being negligible, the contractor employed as his superintendent an engineer then in the city's employ, who had been connected with other similar bridges across the same river. Apparently the entire responsibility for the work was placed upon this engineer. Local reports have it that this man, who was in desperate financial straits, was paid a nominal salary but was to be allowed a disproportionate part of the firm's possible profits on the job. On him all of the responsibility for the design and construction of the falsework has been placed, in such investigations as have been made public. His side of the case will never be known, for he was killed by a fall from the bridge only a week before its collapse.

So much for the contractor. At the coroner's inquest the City Engineer stated that he had never seen the plans of the falsework until two or three days after the accident and that he did not consider it the duty of the city to concern itself with the details of the arch centering. To quote a newspaper account of the testimony, "Contractors are supposed to look after the safety of their own men." Had the city been building the bridge by day labor, he said, the City Engineer's office would have checked every detail of the work; but a contract having been let, only a general supervision was incumbent upon the city's representative. Incidentally, his office seems to have been overburdened with work.

Thus in the train of circumstances we have an enforced letting to the lowest bidder, common enough but often dangerous, and a contractor's superintendent driven to economies by the spur of needed profits but not checked by a supervisory engineer looking single-eyed to safety. The combination was fatal—as it would prove to be five times out of ten.

Some consolation might be had in the fact that such a tragedy of errors could never happen if any one of the elements in the train had been up to best or even standard practice were it not for the fact that it is the lapses from good practice that bring disaster. For that reason, if for no other reason, the story of the Post St. bridge should be read and inwardly digested by every engineer.

Big Experiment in Community Planning

An extensive practical attempt is being made in North Carolina to build up on sound engineering and sociological lines an agricultural district in which may be developed all the joys of best community life combined with the independence of the farmer. This is the first attempt of this sort in America—at least on any such scale and with any such completeness of plans. The opportunity, however, was unusual, for here at New Holland, as described elsewhere in this issue, a single engineering project opened up an untouched fertile area of 50,000 acres under the control of a single group of promoters, but surrounded by a ring of prosperous farms.

If the plans of the Mattamuskeet lake-bed owners go through in their entirety, then there will be a network of drainage and light transportation canals and a parallel system of roads, well planned, properly constructed and adequately maintained. There would be built one large town and three subsidiary community centers, each with post office, stores, schools and other social facilities. There would be some definite provision for binding the residents of this district together with various common political and social interests that should promote acquaintance and coöperation. Manifestly, if these ambitious plans can be carried to completion, the experiment will be of great value to the entire country, as it ought to demonstrate how rural life can be made more prosperous and attractive than metropolitan existence.

But the Mattamuskeet promoters must, for the greatest measure of success, exercise extreme caution in securing proper colonists. They must preserve their ideal of what

this community can be. They must back their convictions with courage—and money. In this last element lies the key to the success of the experiment, for the fixed charges on the entire vast property must be carried along by the pioneers until the land is colonized; and there is some danger that the burden may become so great that the present owners may be led to sell off a big tract without restrictions. A fair profit seems promised the Mattamuskeet men on their risked capital, if they are tenacious—and, what is more satisfying, lasting credit for conspicuous attainment in the improvement of American rural conditions.

City Planning Sweeps On but Needs More Help from Engineers

The gospel of city planning is being preached throughout the length and breadth of the country and city-planning commissions are being created or are already at work as never before. Plans more or less comprehensive are being executed in cities large and small. In all this preaching and planning and realization of plans the engineer is taking a considerable part, but he might do more if he were more awake to the opportunity and better fitted by reading, observation and practice to grasp it.

Glimpses here and there of what has been going on of late will serve to give some idea, but a very incomplete one, of current city-planning activities. These birdseye views are confined chiefly to propaganda, new commissions and the like and take little account of plans being executed.

At Bridgeport, Conn., a so-called final report on city planning, which it is hoped is really only the beginning of actual work, has been made by John Nolen, of Cambridge, Mass. About 70 local corporations, firms and individuals contributed $4370 for the studies, besides which the city appropriated $6000. The sudden rapid growth of Bridgeport of late makes intelligent control of city planning almost imperative, but not every city in need of such work has yet entered upon it.

In Pennsylvania the Altoona Real Estate Exchange was recently addressed by a member of the Reading City-Planning Commission who is also an officer of the Pennsylvania State Association of Planning Commissions. Here we have a combination of real estate interest, coöperation from another city and mention of a state association. At Reading two sets of city-planning improvements were recently on exhibit at the city hall: One by E. B. Ulrich, city engineer, and one by Emil Nuebling, engineer on the City-Planning Commission. Friendly rivalry between engineers may stimulate local interest in city planning and deserves encouragement.

Way down in Alabama, says the Birmingham *Herald*, a model industrial area of 25 acres is being laid out near Acipco (note the combination of letters) for the American Cast-Iron Pipe Co. by "Morris Knowles, the well-known Boston landscape architect"—doubtless referring to the Pittsburgh engineer of that name.

Ohio shows current activity in four leading cities. Taking them alphabetically we note that at Cincinnati, Dr. Werner Hegemman, city-planning expert, delivered his second lecture under the auspices of the Germanist Society. In Cleveland a clearing house for the city-planning committees of seven civic societies has been formed under the name of the Cleveland City-Planning Federation, as a result of a year's efforts by the directors of the Cleveland Engineering Society. At Mansfield, the City-Planning Commission has secured from the City Council tentative approval of a scheme to exclude an objectionable class of buildings from certain localities and is working on a scheme for residence, business and manufacturing districts. At Toledo, a civic center project was to be discussed at the convention of the Ohio State Association of Architects.

City-planning exhibits in South Bend and Indianapolis will doubtless stimulate interest in city planning in those cities and throughout Indiana, as has been the case with similar exhibits in many other places under the direction of the American City Bureau. Already a bill is before the Indiana Legislature which would compel all cities of the first to fourth class and permit fifth-class cities (under 10,000 population) to establish city-planning commissions.

Jumping to California, the City Council of Fresno, on recommendation of its City-Planning Commission, has authorized the employment of Charles H. Cheney, consultant in city planning, to make six surveys and reports on various city-planning matters, completing one at the end of each successive month, the earlier ones to be of a quick preliminary character in order to get certain matters into line as soon as possible. This shows commendable zeal for early progress.

At Los Angeles a few days ago the Bunker Hill civic center project was again publicly urged, this time by R. S. Rankin, landscape engineer, and Dr. T. P. Gerson, in addressses before the City-Planning Commission.

As has been intimated, the foregoing are only scattered instances, geographically and in character, of what is going on all over the country. There are scores, perhaps a hundred or two, of city-planning commissions—from Massachusetts to California. They are compulsory for all cities in Massachusetts and for a certain class of cities in Pennsylvania and permissive in several other states. New commissions are coming into existence everywhere, either by compulsion, or choice.

No one can deny that the city-planning movement as a whole is sound. It has been far too long delayed everywhere; particularly in America. Present day municipal and social conditions demand widespread, intelligent interest in the subject. Engineers can appreciate this better than most men. They should join in the movement with voice and pen, as they have done at Cleveland.

Oratory, printers' ink and wall exhibits will go far toward arousing interest in city planning; but properly conceived and well executed plans must follow if enthusiasm is to be converted into results. For the immediate future the demand for city plans will outrun the capacity of the men competent to supply them but the chances are many and strong that amateurs and pretenders in city planning will be engaged in many cities. Engineers can help avert this danger. They can urge the importance of securing competent city planners and point out the way to secure such. This may require more study of city planning than has yet been given it by more than a very few engineers, but the subject will prove fascinating to many, will be broadening to all who pursue it wisely, and may qualify a few engineers as expert city planners.

Letters to the Editor

The Narrow-Gage Delusion

Sir—In your issue of Jan. 18, referring to the "Narrow-Gage Delusion," you concede that "a narrow-gage line may be justified in rough mountainous country where extremely sharp curvature is necessary to reduce construction cost."

As a matter of fact, however, even this is not true "within the practical limits of railway operation" for roads of gages of 3 ft. or over. We know, to cite the oft-mentioned case, that thousands of passengers are moved daily in New York City on the 4-ft. 8½-in. gage elevated railroads around curves of 90 ft. radius, and I doubt if there is a country in the world which would permit a 3-ft. gage line to be built with curves of as small a radius as this (the minimum radius allowed on the meter gage lines in the Argentine is 490 ft.).

Curves of anything less than 500 ft. radius are objectionable on any railroad; but curves of much less radius can be operated without danger and entirely within the range of practicability on any railroad up to 5-ft. gage using properly designed rolling stock.

The narrow-gage fallacy is truly a delusion from every point of view. F. LAVIS.

120 Broadway, New York, Feb. 15, 1917.

Excessive Rainfall in 25 Minutes

Sir—Prof. Alfred J. Henry's paper entitled "Floods in the East Gulf and South Atlantic States, July, 1916," printed in the August, 1916, "Monthly Weather Review" and abstracted in "Engineering News" of Nov. 9, 1916, is, as you say, "a valuable special study." In view of this fact I am particularly surprised to note that in the opinion of Professor Henry the precipitation of 2.17 in. in 25 min., which occurred at Mobile, Ala., on July 8, 1916, "appears to be the greatest fall for 25 min. in August as far as the records of automatic gages are concerned." ("Monthly Weather Review," August, 1916, p. 468; "Engineering News," Nov. 9, 1916, p. 887.) The use of the word "appears" by Professor Henry reminds me of the old adage, "Appearances are often deceitful."

From my carbon copy of manuscript, now in the printer's hands, I have gleaned the following facts respecting excessive rates of precipitation. On the basis of the reports of excessive precipitation observed by means of automatic gages at the regular United States Weather Bureau stations and reported in the annual reports of the Weather Bureau, the rate of precipitation mentioned by Professor Henry was about equaled or exceeded on an average of once a year, between 1896 and 1914 inclusive. Evidently, this rate of precipitation is not nearly so extraordinary as Professor Henry's comments would lead one to believe. While the rates of precipitation that I give herewith did not all occur in August, this fact, in most cases at least, makes them more exceptional, rather than less so.

EXCESSIVE PRECIPITATION IN 25 MINUTES

(From records of United States Weather Bureau, 1896 to 1914)

Station	Date	Precipitation in 25 Min.
Pensacola, Fla.	Oct. 20, 1909	3.37
Taylor, Tex.	Apr. 29, 1905	2.83
Anniston, Ala.	Sept. 5, 1906	2.68
Thomasville, Ga.	June 27, 1909	2.66
Kansas City, Mo.	Aug. 23, 1906	2.65
Augusta, Ga.	June 18, 1911	2.46
Galveston, Tex.	Oct. 22, 1913	2.45
Galveston, Tex.	Oct. 6, 1910	2.37
Raleigh, N. C.	July 14, 1914	2.35
Jupiter, Fla.	Oct. 28, 1908	2.29
Galveston, Tex.	Apr. 22, 1904	2.28
Richmond, Va.	Aug. 19, 1908	2.27
Lincoln, Neb.	July 25, 1914	2.24
New Orleans, La.	Sept. 30, 1905	2.23
Baltimore, Md.	Aug. 25, 1911	2.22
Concord, N. H.	July 7, 1907	2.18
Montgomery, Ala.	May 30, 1905	2.15
Meridian, Miss.	Aug. 13, 1906	2.15
Cincinnati, Ohio	May 20, 1902	2.13

The table contains three August records out of a total of 16 records that exceed the Mobile record of July 8, 1916, and three records that nearly equal it. A number of additional records that nearly equal the Mobile rate could be given.

The foregoing comments apply to Professor Henry's statements as printed. Why this storm, which is given as having occurred on July 7, on page 427 of the July "Monthly Weather Review," and on both July 7 and July 8, on page 468 of the August "Monthly Weather Review," is referred to as an "August" storm is not apparent. That is one reason why I have included other than August storms in my list. Moreover, according to the data given on page 468 of Professor Henry's article, the precipitation was 1.92 in. in 25 min. instead of 2.17 in. Furthermore, the data given on page 427 of the July issue of the "Monthly Weather Review" for the same storm give 1.62 in. in 25 min. This value, however, might be increased somewhat if the complete 5-min. accumulations for the later part of the storm had been published.

It might be remarked that the portion of the manuscript above referred to, from which these precipitation data are taken, is the result of a six months' intensive study of precipitation data by a member of the writer's office staff and will no doubt contain considerable additional information of interest and value to those engineers who have occasion to use meteorological data. ADOLPH F. MEYER.

Minneapolis, Minn., Jan. 25, 1917.

[Proof of Professor Meyer's letter has been submitted to Professor Henry. The comment of the latter follows.—Editor.]

Sir—When I prepared the original article it was physically impossible, in the short time at my disposal, to make a thorough examination of the previous 25-minute records of excessive precipitation, especially by reason of the fact that the arrangement of the records does not lend itself to a ready determination of the maximum amount for any 25-minute period. In fact, it is only by recourse to the original records that the maximum 25-minute rate for the entire storm can be accurately obtained. For this reason, and also because it was not a matter of vital interest whether or not the Mobile rain storm was the greatest on record, I made the remark quoted by Professor Meyer. In Professor Meyer's list, which includes a record of 13 years, three cases of July precipitation in excess of the Mobile rain storm are given, or about one every four years, which, after all, we should not consider as a frequent phenomenon. I regret that the slip occurred.

Washington, D. C., Feb. 2, 1917. A. J. HENRY.

Humorous Side of Sewage Disposal

Sir—An element of gayety was added to a recent meeting of the New Hampshire Board of Health by a letter from an irate citizen, evidently a French Canadian, who had got the idea that a house sewage-disposal tank recommended by the board would produce good drinking water. The letter, which was originally sent to the health officer of Lisbon, who had given the citizen instructions for building the tank and had said that the effluent would be as clear as ordinary brook water, follows:

I write to tell you dat the box built by Louis LaFlam to make water from Priva as good as new is not worth one dam. He built box just as you say plug up tight with out hole only one end and run pipe to my barn for cow and horse which wond drink water I dont know why, but think it no good so I try it. I dont feel much good two three day my man Joe Bodro try it he puke all over place have Dr. You send me $25 all right if not I give you dam licking some time. (signed) LOUIS LA FLAM.

By way of further explanation it may be noted that in "Engineering News" of Dec. 17, 1908, there was reprinted an article from the New Hampshire "Bulletin of Sanitation," showing how a cesspool has been remodeled so as to provide free discharge that gave no offense. Several hundred tight, free-flowing sewage tanks have been built in New Hampshire for household use and for summer resorts, which have successfully accomplished their purpose in producing an effluent that is as clear as ordinary pond water and practically odorless. The writer has on his table samples of effluent from such tanks, at least one of which is more than two years old and all of which have remained practically clear and have developed no unpleasant odor. Those who build such tanks are advised that this effluent is still sewage and must not be allowed to reach any source of water-supply.

ROBERT FLETCHER,
President New Hampshire Board of Health.

Hanover, N. H., Feb. 13, 1917.

Army Engineer Reserve Corps Filling

Commissions had been accepted by 71 officers in the Engineers Reserve Corps, U. S. Army, up to Feb. 15, 1917; over 1200 applications have been received and are being made at a rate of 150 to 200 per month. Examining boards in important cities are still busy. The pertinent parts of the Army Reorganization Act of June 3, 1916, were abstracted in *Engineering News*, July 13, 1916, p. 93, and the governing orders of the War Department, defining qualifications, were given Aug. 17, p. 327. Application should be made to the Chief of Engineers, War Department, Washington, D. C.

In war operations, the Engineer Corps of the Army is required to furnish officers for duty (1) with the forces at the front, and (2) on lines of communication in rear of the front, or for special services in other localities. The two services are coördinate and of equal importance, but for purposes of classification in the records, the examining boards for the Engineer Reserve are required to recommend candidates for one class or the other. On account of the fact that the first class, designated Class A for convenience, will presumably be needed first for service with the mobile army, candidates for the higher grades (captain or major) are examined in military subjects. As there will be more time for the military training of the second class (designated Class B) no examination in military subjects is required, though military training is considered. In actual service, men in Class B may be used for services usually required of Class A, and in the commissions of officers no distinction is made.

The qualifications of engineers who are wanted for commission in the Engineer Officers' Reserve Corps, together with some of the duties required of them are as follows:

CIVIL ENGINEERS

General construction engineers, for the design, construction and maintenance of earth and concrete fortifications, wharves, piers and buildings of all kinds; highway engineers, for the layout, construction and maintenance of roads and trails on lines of communication or in other localities, including highway bridges of all kinds, ferries, fords, etc.; sanitary engineers, for the design, construction, maintenance and operation of water-works, sewage-disposal plants, etc., in connection with camps or localities occupied by troops within the zone of operations; topographical engineers, for making maps of all kinds within the actual or probable zone of operations, for training of topographical units for the front, and for all kinds of map reproduction, especially photo-lithography.

ELECTRICAL ENGINEERS

This class will be required for services such as the following: Design, construction, maintenance and operation of electric railways forming a part of the lines of communication, including the power plants connected therewith; the installation and operation of electric plants at seacoast fortifications and such power plants as may be needed on the lines of communication; the operation and maintenance of searchlights and other electrical equipment used in the protection of places on the lines of communication or other places not at seacoast fortifications; the training of troops in the care and operation of searchlights for the services of the front; the repair of searchlights and other electrical equipment used by troops at the front.

RAILROAD ENGINEERS AND OPERATING OFFICIALS

This class requires all those engineers and operating officials ordinarily included in the organization of a commercial railroad system, including engineers for the location and construction of track, bridges, stations, etc.; engineers and officials for the maintenance of same, including wrecking operations; operating officials, such as general managers, superintendents, etc.

MECHANICAL ENGINEERS

This class will be required for such services as the installation and operation of machine shops for the maintenance and repair of railroad or other engineer equipment used on the lines of communication and for the design, maintenance and repair of engineer equipment used by the combatant troops at the front, including the field railways.

MINING ENGINEERS

This class will be required for such services as the construction of fortifications on the lines of communication or other places removed from the front; in the training of troops for service at the front in sapping and mining operations; and in use of explosives.

The following list of captains and majors is from that of the Chief of Engineers, with affiliations added:

MAJORS

Parsons, William B., M. Am. Soc. C. E., Consulting Engineer, New York City.
Sewell, John S., M. Am. Soc. C. E., General Manager, Alabama Marble Co., Gantts Quarry, Ala.
Gillis, Harry A., M. Am. Soc. M. E., Mechanical Engineer, Washington, D. C.
Mershon, Ralph D., Fel. Am. Inst. E. E., Consulting Electrical Engineer, New York City.
Dwight, Arthur S., M. Am. Inst. M. E., Mining Engineer, New York City.
Arnold, Bion J., M. Am. Soc. C. E., Consulting Engineer, Chicago, Ill.
Sutton, Frank, M. Am. Soc. C. E., Geographer, United States Geological Survey, Washington, D. C.
McGuire, James C., President, J. C. McGuire & Co., Engineers and Contractors, New York City.
Smith, Glenn S., Washington, D. C.
Finney, John H., M. Am. Inst. E. E., Aluminum Company of America, Washington, D. C.
Waitt, Arthur M., M. Am. Soc. C. E., Consulting Engineer, New York City.
Hunt, Conway B., M. Am. Soc. C. E., Engineer of Highways, District of Columbia, Washington, D. C.
Jonah, Frank G., M. Am. Soc. C. E., Chief Engineer, St. Louis & San Francisco R.R., St. Louis, Mo.
Dennis, William F., M. Am. Soc. C. E., Consulting Engineer, Washington, D. C.
Williams, Gardner S., M. Am. Soc. C. E., Consulting Engineer, Ann Arbor, Mich.
Ostrup, John C., M. Am. Soc. C. E., Consulting Engineer, New York City.
Poole, John H., Assoc. M. Am. Soc. C. E., Detroit, Mich.
Tracy, Evarts, Architect, New York City.
Stern, Eugene W., M. Am. Soc. C. E., Chief Engineer of Highways of Manhattan, New York City.
Molitor, F. A., M. Am. Soc. C. E., Consulting Engineer, New York City.

CAPTAINS

Maxfield, Howard H., M. Am. Soc. M. E., Master Mechanic, Pennsylvania R.R., Pittsburgh, Penn.
Reimer, Arthur A., Assoc. M. Am. Soc. C. E., Engineer of Water Department, East Orange, N. J.
Whitted, Thomas B., M. Am. Soc. M. E., Mechanical Engineer, Charlotte, N. C.
Lyon, Leon E., M. Am. Soc. C. E., United States Assistant Engineer, Norfolk, Va.
Allen, Walter C., Assoc. Am. Inst. E. E., Secretary, Public Utilities Commission, Washington, D. C.
Clarke, Thomas C., M. Am. Soc. C. E., President, Industrial Service Corporation, New York City.
Lawson, William M., Assoc. M. Am. Soc. C. E., Assistant Engineer, Board of Water-Supply, New York City.
Robison, Charles D., M. Am. Inst. E. E., Forstall & Robison, Consulting Engineers, New York City.
Quinby, Edwin R., M. Am. Soc. C. E., Chief Engineer, Consolidated Telephone and Electric Subway Co., New York City.
Davis, Chandler, M. Am. Soc. C. E., Consulting Engineer, New York City.
Chaffee, Robert W., New London, Conn.
Taylor, James L., Jr., Pittsburgh, Penn.
Curfman, Lawrence E., Assoc. M. Am. Soc. C. E., City Engineer, Pittsburg, Kan.
Talman, John T., Washington, D. C.
Gifford, George H, Jamaica, N. Y.
Hilder, Frazer C., Assoc. M. Am. Soc. C. E., Assistant Engineer, Office of Indian Affairs, Washington, D. C.
LaCroix, Morris F., M. Am. Inst. M. E., Mining Engineer, Cleveland Cliffs Iron Co., Ishpeming, Mich.
Hobson, George F., Chevy Chase, Md.
Boyatt, Lynn C., Bowling Green, Ohio.
Matlaw, Isaac S., Assoc. M. Am. Soc. C. E., Assistant Engineer, Public Service Commission, New York City.
Hogan, John P., M. Am. Soc. C. E., Division Engineer, Board of Water-Supply, New York City.
Barker, Harry, M. Am. Inst. E. E., Associate Editor, "Engineering News," New York City.
Kane, Irving P., Assoc. M. Am. Soc. C. E., Assistant District Engineer, International Joint Commission, Gittings, Md.

Timber Bridge Floor Fires with Special Reference to McKinley Bridge Fire

By Hermann von Schrenk*

For the second time within the last three months a part of the roadway of the McKinley bridge at St. Louis burned on Feb. 15, as noted in *Engineering News*, Feb. 22, 1917, p. 332. In view of the frequent occurrence of these fires, a careful inspection was made of the bridge the day following the last fire in order to ascertain the cause, if possible.

It was found that both the fire last fall and the one which occurred last week seemed to have originated under-

FIG. 1. McKINLEY BRIDGE FLOOR, SHOWING WEAR

neath the driveway. The driveway is constructed of 8x16-in. creosoted stringers, over which hardwood slats 1 in. thick were laid on edge. When first noticed, smoke was pouring out from both underneath the bridge and through cracks in the hardwood slats. An examination showed that the creosoted stringers were blazing, and, in order to get at the fire, it was necessary to rip up a considerable number of the hardwood sections. A careful examination showed that in both fires the only portion of the driveway which burned to any extent were the creosoted stringers. The hardwood slats lying immediately above the stringers were practically untouched.

The fire obviously started at one point and rapidly progressed eastward between the individual stringers for a very considerable distance. There was a strong west wind blowing at the time. A careful examination of the entire situation leads to the following conclusions:

The fire undoubtedly originated at the top, because there is no navigation in the ice-filled river at the present time. Many of the slats are broken at the ends, due to the heavy traffic, so that numerous holes occur in some of them all the way through; in other cases, only partially through. Many of these holes are filled with chips and slivers of wood, dry manure, and other highly inflammable material, as indicated in the attached views. It is conceivable that a lighted match or burning cigarette or cigar stub would set fire to the débris in one of these holes. This material need not necessarily have burned, but owing to its punky condition probably glowed. It should be mentioned, incidentally, that all of this material was very dry, because there had been no rain for a week or more. A hot glowing mass in one of these holes would rapidly have progressed to the bottom of the slats and set fire to the timbers underneath.

The ignition of the timbers underneath was undoubtedly favored by the strong air current which blew between the individual series of stringers from the west to the east. The construction was of such character that the stringers practically formed a series of continuous flues, because between every I-beam and the lower space of the slats there was a considerable space, affording direct communication between two sets of stringers placed end to end. It is a well-known fact that a flame started on a flat surface will work through a nail hole or other crack, particularly if a strong wind is blowing under the surface. The writer has witnessed this during the last months in connection with experiments made with roof fire tests, in which a burning brand will invariably communicate the fire to the roof boards underneath wherever a nail hole or other crack affords an opportunity. After the stringers had been set afire, it is easy to understand why

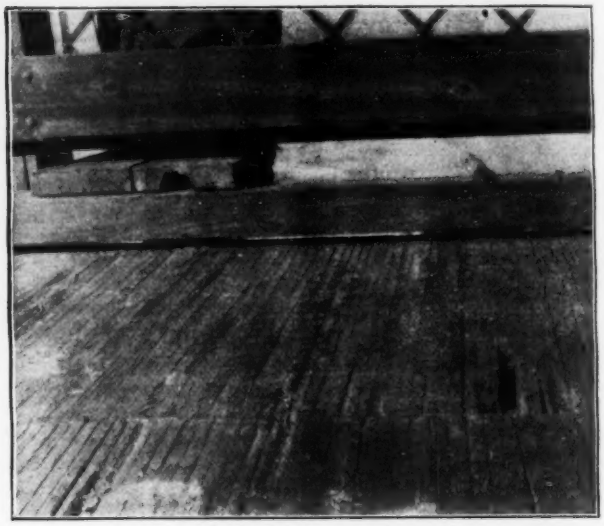


FIG. 2. HOLES AND GROOVES IN TIMBER FLOOR

the fire should have raced across the bridge in an easterly direction.

The point of particular interest in connection with these two fires (both of which occurred in the same manner and with the same results) deals with the relation between the use of timber deck and the fire hazard. After a careful study of these two fires, the writer is of the opinion that the chief reason for the high fire hazard lies in the present method of construction. The hardwood slat deck, with the slats placed on edge, is bound to tear and break. Slats placed on edge under heavy traffic afford the weakest possible resistance, and can in no way be compared to the resistance offered by the same wood when placed so that the wear comes on the end of the fibers, as in the case of wood block. Where such slat construction is used, it should have a solid deck between the slats and the timber beams. According to the writer's opinion, however, these slats should never be used in the form in

*Consulting Timber Engineer, St. Louis, Mo.

which they occurred on the McKinley Bridge. A very much more efficient method of construction consists in building a solid deck and placing regular creosoted wood block on this closed deck. This type of construction is exemplified in the new Municipal bridge across the Mississippi River and the reconstruction of the Manhattan Bridge in New York City.

A number of recent fires on bridges with wooden beams and floors have brought out the criticism in some quarters that the use of wooden construction was not warranted on highway bridges. The writer has examined three such cases during the past year, and in every instance the fire was due not so much to the fact that wood was used as it was to the faulty construction. There is of course no gainsaying that untreated or creosoted timbers will burn when put under conditions where ignition is possible. This, however, is no reason for absolute condemnation of wooden construction. No structural material is perfect, and it is good practice in every instance so to safeguard structural materials that their various defects may cause as little trouble as possible. Where bridges are built of steel, the utmost care is usually exercised in keeping them painted with proper paint, so as to avoid rusting. In the same manner it is misuse of a good material, like timber, to use it where the chances are that it will not serve its best purpose.

In one of the recent fires, the ignition was undoubtedly caused by sparks falling into rotten portions of the roadway and of the substructure. These more or less decayed parts glow and then set fire to the sound wood. The safe practice is to use only properly preserved stringers. This will effectively guard against any decay taking place, which is not only desirable from a strength standpoint, but from a fire-resistant standpoint. These stringers should then be properly protected against ignition from above, where the greatest danger usually occurs. Such protection can readily be given by putting on a solid deck and constructing the roadway of an approved type of creosoted wood block.

Whatever criticism is directed against the timber construction as a matter of policy should be directed against faulty construction and design rather than any inherent quality in the material. Properly designed and constructed bridges of timber construction have stood for many years without deterioration, and the occurrence of fires, such as the one herein described, should be regarded as the exception rather than the rule.

Questions Relating to Engineering Ethics Answered

The American Institute of Consulting Engineers has inaugurated the practice of reviewing and answering questions that may be raised regarding the ethics of engineering practice. These questions are passed upon by the institute's Committee on Professional Practice, which reports to the council; and the latter orders such decisions made public as are believed to be of general interest to the profession. We are indebted to F. A. Molitor, secretary of the institute, for the following answers, approved for publication at the council meeting on Jan. 2.

CASE 1. GUARANTEE OF DATA OF PREVIOUS ENGINEER—An engineer, A, is asked to design, estimate the cost of and construct a bridge, based upon the surveys and data previously supplied by another engineer, B.

Question: Is it proper or wise on the part of A to accept?

Answer: It would be unwise, in view of the responsibility to the client assumed by A, for him to proceed with the work without personally satisfying himself of the adequacy and accuracy of the data supplied by B, unless it were distinctly understood or stated in the terms of A's engagement that he should assume no responsibility for the correctness of the data supplied to him. Such review and verification is desirable in order to protect both client and engineer from the consequences of erroneous data or misunderstood conditions.

CASE 2. COMMISSIONS FOR RECOMMENDING SERVICES—An engineer, A, received a circular letter from a patent attorney, B, asking A to solicit or turn over to B legal work in patent cases and offering to share B's fees with A in such cases. B gives in this letter the names of five engineers as business references.

Questions: (a) Would it be unethical for A to accept and act on B's proposition? (b) Is it unethical for engineers to permit the use of their names as references in business enterprises or for the promotion of business schemes?

Answers: (a) The sharing of fees or profits as compensation for soliciting engagements is regarded among engineers as unethical. This does not apply to the division of fees in cases where two or more engineers are jointly employed or engaged upon the same work. (b) It is regarded as at least imprudent for an engineer to permit the use of his name as a reference regarding the character and responsibility of persons or business concerns for advertising purposes. The practice might lead not only to personal embarrassment, but to the discredit of the profession.

CASE 3. FEE WHEN WORK IS SUSPENDED—An engineer is employed by a client to design, make plans for and superintend the construction of an important work, his compensation to be based upon a percentage of the cost of the completed work. At a certain stage of the progress of the work the client decides or is compelled to abandon or suspend the work, through no fault of the engineer.

Question: Is the engineer entitled to claim and receive the whole amount of the fee which would be due him if the work had gone on to completion?

Answer: Such contingencies should be provided for in the original agreement between engineer and client. In the absence of such a provision and unless the circumstances should warrant a different action, and particularly where the abandonment occurs through no fault or bad faith on the part of the client, settlement upon an equitable basis for the work already done and the expenses and obligations already incurred would be fair and just to both parties.

CASE 4. BIDDING ON PROFESSIONAL WORK—A city, by public advertisement, asked for proposals from engineers to perform certain professional services, the obvious purpose being to secure the services at the lowest possible cost.

Question: Should engineers recognize or take part in such public competitions for services where it is to be presumed that the lowest bidder will be engaged for the services?

Answer: This method of procuring engineering services should be discouraged. It is not regarded as ethical for reputable engineers to enter such competitions. This does not, however, apply to competitions for designs for a specific structure, where such competition is properly conducted and provision is made for reasonable compensation for rejected designs.

The Institution of Civil Engineers of Great Britain, in a recent circular, urges that engineers should not enter into competition at the invitation of municipalities, because of the lack of equity, dignity and proper compensation offered.

CASE 5. ENGINEER'S DUTY TO CLIENT—An engineer was employed by a client to make an investigation and report upon a specific matter relating to the client's business. In the course of the investigation the engineer made discoveries which, while foreign to the subject of his specific engagement, were so related to the business of the client as to be of great importance to him and, if disclosed, might seriously affect that business. These discoveries were mentioned in the engineer's report. The engineer later, at his own expense, pursued the discoveries further, and they appeared to be of great industrial value and scientific interest.

Question: Does the present ethical relation of the engineer to his former client permit him to develop these discoveries for his personal use or profit or to publish an account of them in the interest of science?

Answer: In so far as the case presented involves questions of the proper relations between engineer and client, the committee would reaffirm the broad general principle that the engineer should not make use of information or discoveries, or the results therefrom, obtained while in the service of a client, in any manner adverse to the interests of the client.

News of the Engineering World

Big Paving Contract Declared Void

The Supreme Court of New Jersey has rendered an interesting decision covering contract awards made under certain conditions in setting aside the contract for the improvement of the White Horse Pike, from Absecon to the Atlantic County line, with "Warrenite," recently awarded by the Board of Freeholders to Liddle & Pfeiffer, Perth Amboy, at a cost of $693,443. This contract was made on Nov. 8, 1916, on condition that it would become void if the Egan Road Bill, providing a fund of $7,000,000 for the construction of state highways, was approved at the regular election, held simultaneously. This stipulation was later rescinded and the award made final. The Supreme Court, in its decision, holds that the contract had been invalidated by this qualifying provision, saying:

> If such an award can be made to depend upon one condition, why not on two or many? If this condition in the award can be nullified after 16 days at a special meeting, why not after 30 or more days, until the award of the contract will be left in confusion and uncertainty and the legality of the bonds issued to pay the cost impaired? While not aware of any statute or decision that either permits or forbids public contracts to be awarded upon conditions, on the ground of sound public policy contracts so awarded should be declared void.

Connecticut Engineers' Society Holds Thirty-Third Annual Meeting

The Connecticut Society of Civil Engineers is one of the oldest, if not the oldest, of the state engineering societies. At the same time it is steadily growing, its meetings are well attended, and it shows none of the infirmities of age. The success of its annual meetings is partly due to two things: First, the society represents a small state, where access is readily had by a majority of the members to the place of meeting; and second, a definite scheme of conducting the meetings was long ago worked out and has been steadily adhered to.

This scheme involves a 1½-day program—a business session in the morning of the first day, an afternoon session devoted to somewhat elaborate papers or lectures by engineers outside the society and an evening banquet where engineering subjects are taboo. This is followed the next morning by a series of papers and discussions by society members on subjects of local importance. This program has the advantages of variety, compactness and brevity, all of which are distressingly rare in the meetings of most state engineering societies.

In this respect the Connecticut society may well serve as a model for others, but in another it is somewhat behind, due no doubt to the characteristic New England conservatism. The society is only now beginning to realize its obligations and opportunities as a leader of engineering thought in the state or as a public defender and investigator of the profession. The prospect is, however, that in the future this view of the society's function will grow and that such subjects as the justified influencing of legislation, the disciplining of members and the proper use of publicity in engineering matters will receive their due attention.

The thirty-third annual meeting of the society, held in New Haven, Feb. 20 and 21, 1917, was typically good. The outside lectures were on the new Memphis bridge, by Ralph Modjeski; on deep-foundation practice, by James W. Rollins; and on the car-float transfer bridges common to New York harbor, by J. B. French. The local papers comprised a description of concrete construction on Hartford's new water-supply work, by the Chief Engineer, C. M. Saville; on the proposed sewerage system of Bridgeport, by the city engineer, A. H. Terry; on enlarging the Lake Whitney dam at New Haven, by O. H. Marchant; on street-car track maintenance, by P. N. Wilson, of the Connecticut Co.; and a paper entitled "Some Problems of an Engineer in Public Service," by C. J. Bennett, who occupies the position of Highway Commissioner of Connecticut, a position hitherto held by non-engineers. Mr. Bennett's paper was particularly good in that it corrected the all too current impression among engineers that an engineer will make an efficient public executive merely because he is an engineer.

As an extension of the military census now under way in Connecticut, the meeting recommended that the society make for its own files an engineering census of the state, so that in case of necessity the War Department could obtain on short notice a list of all the engineers in the state, together with their specific qualifications for military or engineering duty. The president elected for the ensuing year is Henry R. Buck, of Hartford. The secretary is J. Frederick Jackson, of New Haven.

Indiana Water-Works Men Convene

The tenth annual meeting of the Indiana Sanitary and Water-Supply Association was held at the Claypool Hotel, Indianapolis, Feb. 14 and 15, 1917. An effort was made to increase general discussion by four round table topics on "Water-Works Accounting," "Surreptitious Use of Water," "Distribution System Extensions" and "Meter Department Operation."

Fire protection systems were considered the most flagrant cause of water stealing. Large amounts of unpaid-for service were cited, mostly brought about by the over-anxiety of some boiler room employee to reduce operating costs. J. B. Marvin discussed fire fighting methods in Indiana, a subject of particular interest at the present time because of pending legislation to standardize hose-threads over the state. Of 210 organized fire forces in the state only 16 are equipped with hose and hydrants of standard dimensions.

Judge Clark, of the Indiana Public Service Commission, in discussing "How Shall a Utility Prepare for Future Demands?" pointed out the need of a large working capital at the present in laying in large coal supplies. Mains and services should be laid in advance of street improvements. Investigations were advised looking to

future sources of water-supply; but the proviso was made that where these consist of land the natural crop return will often pay the interest charge and when the property is later put into use as a part of the system it can be capitalized at the appreciated value.

H. E. Garman, in discussing "Recent Decisions of the Public Service Commission," stated that the Commission is doing all possible to encourage metered service. A ready-to-serve charge for private fire protection is established in all cases. A total of $14,000,000 water-works property was appraised by the Commission in 1916.

In a paper on "Weekly Reports of Water Plant Operation to the State Board of Health," John C. Diggs stated that these are of value in showing waste of chemicals as well as under-treatment. These reports were first ordered in November, 1916, and show daily pumpage, chemicals used, total bacterial count at 37° and B. Coli on the finished water.

Paul Hansen, of the Illinois State Board of Health, in recommending state control of water and sewage plants, recommended an extension of bonding limits wherever necessary to provide for purification-plant construction.

R. A. Butler, discussing "A Method of Financing Sanitary Improvements," emphasized the fact that the water-supply companies were behind both gas and electric utilities in methods of getting new business. The sale of toilet fixtures, washing machines, etc., are just as legitimate part of the water business as stoves in the gas business or lamps in the electric business. In a city like Indianapolis, where the large number of open privies is a menace to public health, the great barrier in the way of their eradication is the cost to the property owner—often struggling to meet payments on his property. A funding company was proposed that could sell sanitary fixtures on the easy-payment plan—leasing them to the property owner, with privilege of removal upon non-payment. The payments for water service would be made by the funding company until payment for the fixtures was complete.

The principal officers elected for the ensuing year were: President, W. F. King, Assistant State Health Commissioner, Indianapolis; First Vice-President, D. J. Toyne, Superintendent Water Department, South Bend, Ind.; Secretary, W. G. Ulrich, Indianapolis Water Co., Indianapolis; Assistant Secretary, J. A. Craven, Terre Haute Water Co., Terre Haute, Ind.—From H. E. Jordan, Indianapolis, Ind.

Iowa Engineers on Licensing Fees and Publicity

Two important steps in regard to licenses and standard fees for engineers were taken at the 29th annual meeting of the Iowa Engineering Society, held Feb. 21-23 at the Iowa State College, Ames, Iowa. A resolution was passed indorsing a bill now being promoted for licensing the practice of civil engineering.

The bill specifies that this includes mechanical, mining, industrial and electrical engineering and land surveying, and "any branch of the profession of engineering other than military or architecture." A board of examiners is provided. Licenses are to be issued only for certain branches of work, but an additional license for other branches may be given (without further examination) if the candidate produces evidence of his qualifications. A broad-minded provision is that the board must keep in touch with the requirements for license in other states, and issue licenses without examination to licensed engineers from states whose requirements are not lower than those of Iowa.

The other action mentioned was in adopting the report of the committee on ethics and fees, which presented a schedule of minimum charges for different classes of engineering work. It was pointed out that in many cases public boards or officials claim that they have no knowledge or information as to the value of engineering services. A schedule of charges would be useful in such cases. In this connection there was considerable discussion as to means of educating the public as to the real purpose and importance of the engineer and his work. Publicity, largely through the local press, was urged, but it must be recognized that the editors and reporters are not posted on these matters and are apt to give much more consideration to the political than the technical side of public affairs. Therefore it is for engineers themselves to see that proper and adequate information is prepared and given out.

Apart from these questions, municipal engineering and administration were most prominent at the proceedings of the meeting. A systematic method of naming streets and numbering houses was outlined by C. H. Young (Muscatine), and an interesting address on the commission-manager plan of city government was given by O. E. Klingaman (State University of Iowa). A paper on the water-works situation and proposed new municipal water-supply system for the city of Clinton (26,600 population) was presented by J. G. Thorne, city engineer. K. C. Gaynor (Sioux City) was elected President; J. H. Dunlap (Iowa City) is Secretary.

Activated-Sludge Tests at Pasadena

An experimental activated-sludge plant was put in operation on Feb. 1 at Pasadena, Calif., to make studies with a view to the production of an effluent that can be disposed of on the projected joint sewage-disposal farm for Pasadena, South Pasadena, and Alhambra. The aërating chamber has a capacity of 50,000 gal. a day, with 4 hr. aëration. There are two settling tanks, a sludge pump and a sludge-aërating tank. The aërating tank has 60 ft. of channel and contains 21 filtros plates. Air is supplied by a No. 1 Nash blower.

R. V. Orbison, City Engineer of Pasadena, writes regarding the experiments as follows:

> At present I am activating my sludge and hope within a few days to be able to start the cycle. Inasmuch as the sewage effluent on our new farm will be used for irrigating various crops we will not have to treat the sewage to a high degree. Consequently our testing plant will show how much air is necessary to secure an effluent of varying degrees of purification, and knowing the amount of air necessary we can then readily calculate the cost of a plant large enough to handle from 3,000,000 to 6,000,000 gal. of sewage daily. I intend to run my tests with various amounts of air and for various periods of aëration.

Mr. Orbison reports that so far the results have been very gratifying, nitrate having been formed and the sludge being in good condition. He says he expects to make a test of a Brosius plant on lines similar to the one at Hermosa Beach, Calif., described in *Engineering News* of Nov. 9, 1916. He also intends to run activation tests on the effluent from an Imhoff tank.

Schenectady Pipe Joints To Be Welded Electrically Inside

Contracts have been let by the Bureau of Water of Schenectady, N. Y., for electrically welding the circumferential joints of 10,200 ft. of 36-in. lock-bar steel-plate pipe put down by a local contractor. The specifications for this work were described in *Engineering News*, Feb. 15, p. 291; bids were asked on inside and outside welding by oxyacetylene and electric methods. The contract was let at $18,336 to the Commercial Welding Co., of New York City, and is for 137 joints in $\frac{5}{16}$-in. plate and 244 joints in $\frac{3}{8}$-in. The bid was based on experimental runs, as no such job as this has been done. By inside welding the cost of excavation is eliminated. Two bids were in for inside welding by oxyacetylene apparatus, one of $11,156 and one at $52,655. The smaller figure was discarded as being impossible. Specifications for the work were abstracted in *Engineering News*, Feb. 15, 1917, p. 291.

Flood Control Bill Goes to President

On Feb. 26 the Senate passed the Humphreys' flood-control bill which had in an earlier session passed the House in practically identical form. The immaterial changes in the bill have now to be accepted by the House and the whole approved by the President before becoming law. This very radical departure from the previous method of taking care of the river control appropriates $45,000,000 for the control of floods on the Mississippi and $5,600,000 for similar work on the Sacramento River. The former work is to be under the direction of the Mississippi River Commission and the latter under the California Débris Commission. Not more than $10,000,000 is to be spent on the Mississippi nor more than $1,000,000 on the Sacramento in any one year, and none of the money appropriated for the Mississippi can be used in the construction or repair of levees unless assurances have been given that the "local interests protected" will contribute a sum equal to at least one-half the amount allotted by the commission.

A 25,000-Gal. Wooden Water Tank Burst at Springfield, L. I., near Brooklyn, at 10:30 p.m., Feb. 21. The tank was full.

Municipally Owned Utilities in Ohio, except water-works, will be brought under the control of the State Utilities Commission and be compelled to follow the same accounting and reporting system as privately owned utilities if a bill before the Legislature becomes a law.

A New Housing Code for Detroit, Mich., will soon go into effect. It covers the design and construction of new dwellings, limits the lot area that may be built upon and contains various other provisions common to modern housing codes. The code was submitted to Lawrence Veiller, a housing reform specialist, of New York City, before adoption. Dr. William H. Price is health officer of Detroit.

About 100 Miles of Water Pipe will be laid in Detroit this year under the direction of Theodore A. Leisen, general superintendent, Detroit Water-Works. A large percentage of this will be in the 31 sq.mi. of recently annexed territory, including 13 mi. of 48- to 36-in. trunk lines. The estimated cost of all the work is said to be about $2,000,000. The pipe is either on hand or contracted for. In general, the work will be done by force account, but some pipe-laying contracts may be let.

Higher Pay for Municipal Engineers at Indianapolis, Ind., has been urged by B. J. T. Jeup, City Engineer, who has submitted the matter to the City Council. This covers the assistant engineers, levelers, rodmen, etc. A strong argument is made that by reason of the present low pay and the high cost of living the department is losing many of its best men, as private firms offer higher salaries. The result is detrimental to the city's interests and there is good economic reason for the increased pay.

The Interstate Bridge Across the Columbia was opened on Feb. 14. It connects Portland, Ore., and Vancouver, Wash. The bridge is divided into three sections, the main part crossing the Columbia River and the others Columbia Slough and Oregon Slough. The Columbia River crossing consists of 14 spans aggregating 3530 ft. One of these is a vertical-lift span. There were 8500 tons of steel in the structure, and its total cost amounted to $1,750,000. The bridge was built by Clarke County, Washington, and Multnomah County, Oregon, the latter county paying about two-thirds of the total cost.

Plans for the Key Bridge across the Potomac River at Washington, D. C., are to be amended so as to bring the cost of the bridge within the original $1,000,000 appropriation. This amount was granted some time ago, but it was found this year that owing to the rise in prices it would be impossible to build the bridge as designed for less than $1,500,000. Accordingly this amount was asked of the present Congress by the War Department, which has the bridge in charge. There appears to be no prospect that Congress will make the additional appropriation, so, it is reported in the Washington press, the authorities are proceeding on an amended design which it is hoped can be built within the appropriation. The main change is reducing the width of the bridge from 80 to 65 ft.

PERSONALS

W. H. Wood, County Surveyor of Bates County, Missouri, has been appointed County Highway Engineer.

J. R. Comly, Assoc. M. Am. Soc. C. E., of San Diego, Calif., is now with the San Diego & Arizona Ry., Jacumba, Calif.

Searcy B. Slack, Professor of Highway Engineering at the University of Georgia, has resigned to engage in private practice.

C. H. Young, for several years City Engineer of Muscatine, Iowa, has resigned to engage in private practice as a consulting engineer, with offices at Muscatine.

John T. Gephart, Jr., formerly Construction Engineer, Pennsylvania State Highway Department, has been made Road Engineer of Fayette County at a salary of $3600 per annum.

T. C. MacNabb, Assoc. M. Can. Soc. C. E., Division Engineer of the Canadian Pacific Ry. at Moose Jaw, Sask., has been promoted to Superintendent of the Revelstoke division at Revelstoke, B. C.

L. B. Andrus, M. Am. Inst. E. E., formerly General Superintendent of the Indiana & Michigan Electric Co., South Bend, Ind., has been appointed Chief Engineer of the American Public Utilities Co., Grand Rapids, Mich.

Dr. Morton G. Lloyd, F. Am. Inst. E. E., recently Technical Editor of the "Electrical Review," Chicago, Ill., has been appointed Associate Electrical Engineer of the Bureau of Standards, Department of Commerce, Washington, D. C.

J. H. Libberton, Division Engineer of the Promotion Bureau of the Universal Portland Cement Co., Chicago, Ill., has been elected Secretary of the American Concrete Pipe Association, succeeding E. S. Hanson, Editor of the "Cement Era."

John C. Slippy, a former civil engineer of Pittsburgh, Penn., and author of "Telephone Appraisal Practice," has been appointed Chief Cost Accountant of the city at a salary of $4000. He has been connected with the Costs Accounts Bureau of the city for several years.

J. W. B. Blackman, M. Am. Soc. C. E., City Engineer of New Westminster, B. C., has enlisted in the Canadian forces for overseas service. He has been granted indefinite leave of absence. **Harry Stewardson,** Assoc. M. Can. Soc. C. E., has been appointed Acting City Engineer.

P. J. Watson, Jr., Assistant Engineer of the Chicago & Alton R.R., Bloomington, Ill., has resigned to become General Manager of the Mulville-Watson Construction Co., Alton, Ill. This company was recently incorporated and will handle construction contracts of all kinds.

H. Peyton Mobberly, Assoc. M. Am. Soc. C. E., formerly Division Engineer of the Texas & Pacific Ry., has opened offices in Springfield, Mo., for the general practice of engineering. He will specialize in the preparation of data and reports on the value of short-line railway properties.

Ivan Sanders, County Road Engineer of Lewis County, Kentucky, has been sentenced to 18 months in the penitentiary for malfeasance in office. The contractor, Edward Rand, is under indictment. The two are charged with defrauding the county in the purchase of lumber for concrete forms.

H. C. Vensano, M. Am. Soc. C. E., has resigned as Civil and Hydraulic Engineer of the Pacific Gas and Electric Co., San Francisco, Calif., to become associated with John R. and Edward G. Cahill, General Contractors, under the firm name of the Cahill-Vensano Co., 460 Montgomery St., San Francisco.

F. H. Frankland, Consulting Engineer of Lake Charles, La., who recently had charge of the construction of bridges for the Calcasieu Parish Highway Department, is now associated with the firm of J. A. L. Waddell & Son, Consulting Bridge Engineers, Kansas City, Mo., and will have charge of the firm's New York City office.

William S. Morton has resigned as Engineer in charge of work in Arkansas for the Missouri Pacific Ry. to accept a position with Henry Exall Elrod, Consulting Engineer, Dallas, Tex. He is a graduate of the University of North Carolina, class of 1904, and for a number of years was in municipal work in Virginia and the Carolinas.

E. L. West, Assoc. M. Am. Inst. E. E., recently President of the Reading Transit and Light Co. and the Metropolitan Electric Co., Reading, Penn., has been elected President of the W. S. Barstow Management Association, New York City. This is a new corporation which will supervise the management of all public-utility properties controlled by the General Gas and Electric Co., the Eastern Power and Light Corporation and W. S. Barstow & Co., Inc.

Edward E. Loomis, recently Vice-President of the Delaware, Lackawanna & Western R.R., New York City, has been elected President of the Lehigh Valley R.R., succeeding E. B. Thomas. Mr. Loomis began his railway experience in 1883 as a secretary to the Attorney of the Denver & Rio Grande R.R. From 1884 he was a secretary and clerk to various operating officials of the New York, Lake Erie & Western R.R. until 1894, when he became Superintendent of the Tioga division of this railway. He went to the Delaware, Lackawanna & Western R.R. in 1899 as Superintendent in charge of its mining interests.

OBITUARY

Willard S. Robbins, for the past 25 years with the United States Geological Survey, died recently at his home in Washington, D. C., aged 56 years.

James Terry, President of the Terry Steam Turbine Co., Hartford, Conn., died at his home in that city Feb. 3, aged 44 years. He was graduated from Sheffield Scientific School, Yale University, in 1895. He was a son of the late E. C. Terry, inventor, and founder of the company.

John J. Burleigh, Vice-President of the Public Service Corporation of New Jersey, died Feb. 18 at his home in Merchantville, N. J. He built the first electric street railway in New Jersey at Camden in 1890, and was the organizer of the Camden Light and Heating Co., which was taken over by the Public Service Corporation.

ENGINEERING SOCIETIES

AMERICAN CERAMIC SOCIETY.
Mar. 5-8. Annual meeting in New York City. Secy., Edward Orton, Jr., Columbus, Ohio.

NATIONAL BRICK MANUFACTURERS' ASSOCIATION.
Mar. 5-10. Annual meeting in New York City at McAlpin Hotel. Secy., T. A. Randall, Indianapolis.

CENTRAL ELECTRIC RAILWAY ASSOCIATION.
Mar. 8-9. Annual meeting in Indianapolis. Secy., A. L. Neereamer, Indianapolis.

NEW ENGLAND RAILROAD CLUB.
Mar. 13-1? Annual meeting in Boston. Secy., W. E. Cade, 683 Atlantic Ave., Boston.

VERMONT SOCIETY OF ENGINEERS.
Mar. 14. Annual meeting in Burlington, at Hotel Vermont. Secy., G. A. Reed, Montpelier.

WISCONSIN ELECTRICAL ASSOCIATION.
Mar. 15-16. Convention in Milwaukee. Secy., George Allison, First National Bank Building, Milwaukee.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.
Mar. 20. Annual meeting in Chicago at Coliseum. Secy., C. W. Kelly, Kelly-Derby Co., Chicago.

ILLINOIS GAS ASSOCIATION.
Mar. 21-22. Annual meeting in Chicago. Secy., Horace H. Clark, 1325 Edison Building, Chicago.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.
Mar. 20-22. Annual meeting. Congress Hotel, Chicago. Secy., E. H. Fritch, 900 South Michigan Ave., Chicago.

ST. LOUIS RAILWAY CLUB.
Apr. 13. Secy., B. W. Frauenthal, Union Station, St. Louis.

DETROIT ENGINEERING SOCIETY.
Apr. 21. Secy., D. V. Williamson, 46 Grand River Ave., W., Detroit.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION.
Apr. 26-28. In Dallas. Secy., H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

The United States Good Roads Association will hold its 5th annual convention at Birmingham, Ala., Apr. 17 to 20, during which time a good roads show of machinery and materials will be held.

The Texas Town and City Planning Association held its annual convention in Sherman on Feb. 9 with an attendance of about 300. The officers elected are: President, Edward H. McCuistion; secretary, J. E. Surratt.

Michigan Engineering Society—The officers for 1917 elected at the recent annual meeting are as follows: President, T. O. Williams, Grand Rapids; vice-president, E. D. Rich, Lansing; secretary, W. W. Cox, Kalamazoo, Mich. The next meeting will be held at Grand Rapids, Mich., in January, 1918.

The American Concrete Pipe Association at its annual meeting on Feb. 15 elected as secretary, J. H. Libberton, 210 South La Salle St., Chicago. Mr. Libberton is division engineer of the promotion bureau of the Universal Portland Cement Co., and succeeds E. S. Hansen, editor of "The Cement Era," who has been secretary of the Association since 1913, when it was formed.

The New Jersey Sewage-Works Association held its first annual meeting at the State House in Trenton on Feb. 16. Forty municipalities were represented and addresses were made by Governor Edge, Rudolph Hering, Clyde Potts and Chester G. Wigley. The officers elected were: President, John R. Downes, Plainfield; vice-presidents, I. Z. Collings and Paul Monitor; secretary, Frederick T. Parker, Atlantic City.

The Engineering Association of Nashville has opened its new quarters in the Commercial Club Building, with the office of the secretary and a technical reading room. The association holds weekly luncheons at 12:30 p.m. Mondays, with the exception of the first Monday in each month when a dinner is held at 6:30 o'clock, followed by a business meeting at 7:30. Visiting engineers are always welcome at these events and at the association's quarters.

The Ohio State Association of Contractors has been organized in Columbus, Ohio, with a membership of about 200. H. E. Culbertson, of Cleveland, is president, William Graham vice-president, and William E. Minshall, general counsel. The purpose of the organization, it is stated, will be to procure uniform contract specifications and methods of contracting, to develop friendly relations among contractors and to educate members and public in matters pertaining to contracting.

The American Institute of Mining Engineers held its 114th convention in New York City on Feb. 19. The importance of Brazil as a producer of manganese ores since the outbreak of the European war was pointed out, it being stated that manganese is one of the few important metals not produced in the United States in quantity commensurate with the demand, and that there is now being imported about 300,000 tons annually. Prior to the war India and Russia furnished the greater part of the American supply. In the evening a reunion celebration was held in the Engineering Societies Building. Philip N. Moore was elected president, having received 1205 votes against Sidney J. Jennings' 1010.

A Drainage Conference is to be held at the University of Illinois (Department of Civil Engineering), Urbana, Ill., on Mar. 13-15. This is the second annual conference and is designed to interest engineers, drainage officials, landowners and others in the reclamation of swamp and overflowed lands and the control of floods. The subjects to be discussed include the organization and financing of drainage districts and the construction of such works as ditches, tile drains, levees and pumping plants. It is stated that while about 3,000,000 acres of uplands have been drained in Illinois, there remain great areas of overflowed lowlands along the rivers, aggregating an area greater than that of Holland, the reclamation of which could add $150,000,000 to the land values of Illinois.

The American Institute of Weights and Measures, organized a few months ago as a defensive measure of manufacturers against the adoption of the metric system in the United States, elected a full staff of officers on Feb. 19. The president is W. R. Ingalls, editor-in-chief of "Engineering and Mining Journal"; vice-presidents, Henry D. Sharpe and D. H. Kelly; treasurer, W. M. McFarland; commissioner and secretary, F.

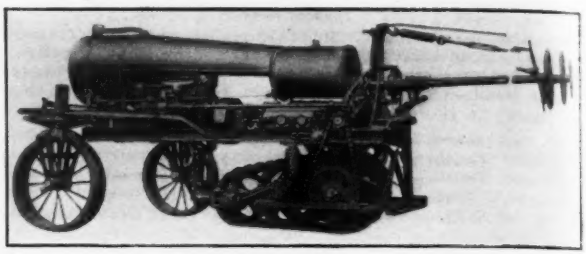
A. Halsey. The annual dues of the association members are $100 for associations national in scope and $25 for all others. The dues of corporation members employing less than 500 employees are $25, and for those employing more than 500 and less than 1000, $50, increasing at the rate of $25 for each additional thousand employees up to a maximum of $500. The annual dues of individual members are $5. The manufacturers believe that the enforced introduction of the metric system would be a calamity. Gages and patterns would have to be changed, while most of the data at present compiled on costs, etc., would be valueless.

The Western Society of Engineers held a Washington meeting in Chicago on Feb. 19, at which papers were presented on engineering work and conditions in George Washington's time. Such a meeting is to be held annually as a patriotic and historical event for engineers. In the future it will be the occasion for the presentation of the "Washington Award," established in 1916 by John W. Alvord, who has given $1000 for the purpose. C. B. Burdick stated that municipal waterworks were built in Boston in 1652; Bethlehem, 1754; Providence, 1772, and Morristown, N. J., 1791. In 1800 there were 16 municipal plants and in that year the first steam pumping plant for water-supply was installed in Philadelphia. City planning began with the early project for laying out the City of Washington. Hydraulic power was confined to overshot and breast wheels for driving grist mills and sawmills, usually requiring less than 10 hp. About 1792 there were numerous projects for canals, and after retiring from the Presidency Washington was interested in the attempt to promote water communication between the Potomac and Ohio Rivers. A short stretch of canal with a lock near Alexandria was planned and built by him. A. N. Johnson presented a paper on road building. In 1790 there were not more than 1800 mi. of post roads, and at about that time broken-stone roads began to be built in this country, but were not introduced into England until 1816. One of the first macadamized roads was built near Alexandria in 1785, and the Philadelphia and Lancaster turnpike was built in 1794, at a cost of $465,000. A military road, built by Washington from Winchester to Wells Creek, Md., could still be traced in 1899. The iron industry in Washington's time was reviewed by James N. Hatch. Most of the finished material produced was pig iron and bar iron. From 1717 to 1770 the production was only 150,000 tons. In addition to the foregoing papers, addresses were made by Ernest McCullough and John G. Kreer on surveying and shipbuilding.

Appliances and Materials

Light Flexible Tractor

The small tractor shown herewith is peculiar in being mounted on a single central caterpillar at the rear end and a pair of caster wheels at the forward end. The controlling handwheels are fitted to a long shaft, so that the operator can ride on the wagon or other trailer. While the machine is intended particularly for agricultural work, it has been used also to operate road drags. It has a four-cylinder gasoline engine, with tubular radiator and with a roller-chain drive to the spring-mounted caterpillar, or "crawler," which has a tread 15 in. wide. The front wheels are 30 in. in diameter, 7 in. wide and are adjustable for a track 45 to 82 in. wide. The machine is 11 ft. long, 8½ ft. wide and 6 ft. high over all. It weighs 5,600 lb. (or only about 4½ lb. per sq.in. of bearing surface). The speeds are 2½ and 3½ mi. per hr., with a reverse speed of 2 mi. per hr. The engine can be adapted to run on gasoline, kerosene, distillate or alcohol and is said to give about 30 hp. at the belt or 13 hp. on the drawbar. The machine is called the "Bates Steel Mule" and is built by the Joliet Oil Tractor Co., of Joliet, Ill.



BATES "STEEL MULE" TRACTOR

* * *

Corrugated Wire-Glass Sheets

Corrugated wire-glass in sheets, designed for use as translucent roofing and siding sections in connection with corrugated sheets of asbestos concrete, has just been introduced by the Keasby & Mattison Co., of Ambler, Penn. The glass is made in sheets 27½ in. wide and of lengths of from 4 to 10 ft. The depth of corrugation is 1 in.

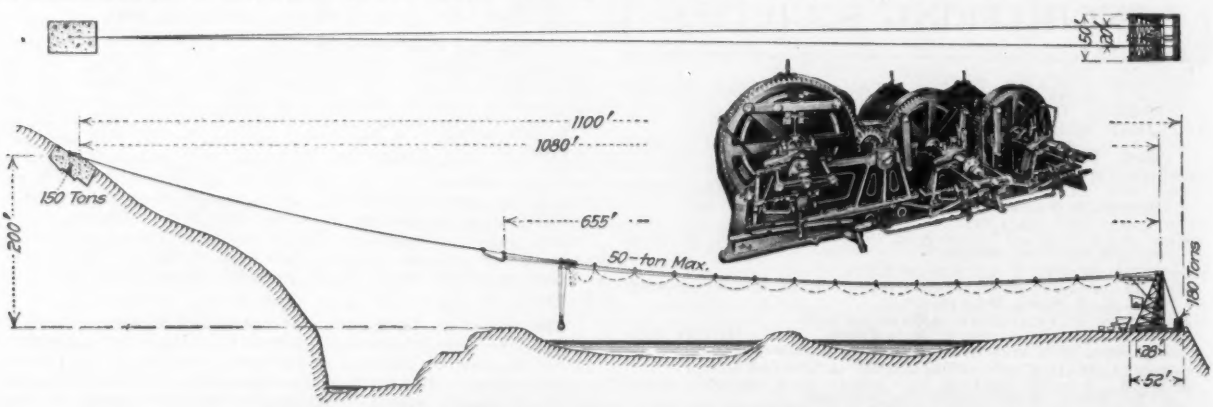
* * *

Long Cableways with Band-Friction Hoists

Two unusual cableways have recently been completed by S. Flory Manufacturing Co., of Bangor, Penn., for the Furukawa Mining Co., of Japan, to be used in reclaiming copper slime tailings flushed from a large mill into a settling basin. The cableways are of a twin radial design having a clear span of 1080 ft., though the carriages are operated over only 655 ft. of the span, as shown in the accompanying sketch. The pair of cableways are designed to move at least 9720 cu.ft. of slime sand per 8-hr. day, hoisting 400 ft. Each carriage and loaded bucket weighs about 8½ tons. A single tower car is used, but it has two towers and two operating platforms. These towers are of wood construction and rise 60 ft. above the track; the car has steel wheels and travels on a steel track (1000 ft. radial movement).

The cables are designed to carry a maximum tension of 50 tons. The main cables are 2½ in., the running and moving ropes ¾ in., the guys 1⅛ in. and the anchorage ropes 1⅜ in. The cable head ends are anchored to the rear of the towers in a 180-ton concrete counterbalance. The tail ends go around separate sheaves and are anchored in a 150-ton concrete block in the hillside. This tail anchorage is 200 ft. above the tower base. One rope line opens and shuts the bucket (a specially built 1½-yd. Hayward Type G clamshell), one line (two-part at the bucket) raises the bucket, and one endless line traverses the trolleys.

Each cableway has a special three-drum hoist with a 200-hp. 500-volt three-phase slip-ring motor with solenoid brakes and magnet control (from the platforms, where the operators have a full view of operations). Each hoist has drums 48 in. in diameter by 42 in. long with band frictions. This is the first application of the Werner band friction (see "Engineering News," Feb. 11, 1915) to cableway hoists. Frictions are worked by mine-hoist air thrusts supplied from a single motor-driven compressor unit. The tower can be moved by a 22-hp. electric hoist winding up ropes running through blocks.



RADIAL CABLEWAYS AND HOISTS FOR FURUKAWA MINING CO.

Construction News

IRON AND STEEL

Pig Iron—Below are the present quotations, with a comparison of a month and a year ago:

	Feb. 27, 1917	One Month Ago	One Year Ago
CINCINNATI			
No. 2 Southern foundry	$27.40	$25.90@27.90	$17.90@18.40
No. 2 Northern foundry	34.26	31.26	19.26@19.76
NEW YORK			
No. 2X Northern foundry	32.00@32.50	30.00@31.00	19.75@20.00
No. 2 plain Northern foundry	31.00@31.50	29.00@30.00	19.25@19.50
No. 2 Southern foundry†	29.00@30.00	29.00@30.00	19.50@20.00
BIRMINGHAM			
No. 2 Southern foundry	24.50	24.00@25.00	15.00@15.50
CHICAGO			
No. 2 Northern foundry	33.00	30.00@31.00	18.50
PITTSBURGH			
Bessemer iron*	35.95	35.95	20.70
Basic iron*	30.95	30.95	18.70

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered tidewater, New York.

Pipe—The following discounts are for carload lots f.o.b. Pittsburgh, in effect Feb. 14, 1917:

Butt Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
¾ to 3	62%	48½%	¾ to 1½	52%	38%
Lap Weld					
2	55%	42½%	1¼	38%	23%
2½ to 6	58%	45½%	1½	44%	36%
7 to 12	55%	41½%	2	45%	31%
13 and 14	45½%	....	2½ to 4	47%	34%
15	43%	....	4½ to 6	47%	34%
			7 to 12	46%	33%
Butt Weld, Extra Strong Plain Ends					
¾ to 1½	60%	47½%	¾ to 1¼	53%	38%
2 to 3	61%	48½%			
Lap Weld, Extra Strong Plain Ends					
2	53%	41½%	1¼	40%	25%
2¼ to 4	56%	44½%	1½	45%	31%
4½ to 6	55%	43½%	2	47%	34%
7 to 8	51%	37½%	2¼ to 4	49%	37%
9 to 12	46%	32½%	4½ to 6	48%	36%
			7 to 8	42%	30%
			9 to 12	37%	25%

From warehouses at the places named the following discounts hold for steel pipe:

	Black: New York	Black: Chicago	Black: St. Louis
¾ to 3 in. butt welded	54%	56.8%	56.27%
2½ to 6 in. lap welded	47%	52.8%	52.27%
7 to 12 in. lap welded	40%	49.8%	49.27%

	Galvanized: New York	Galvanized: Chicago	Galvanized: St. Louis
¾ to 3 in. butt welded	38%	42.8%	42.27%
2½ to 6 in. lap welded	29%	39.8%	39.27%
7 to 12 in. lap welded	16%	35.8%	35.27%

Malleable fittings, Class B and C, from New York stock sell at 15 and 5% from list price. Cast iron, standard sizes, 42½ and 5%.

Rivets—The following quotations are per 100 lb.:

	Structural: Mill, Pittsburgh	Warehouse: New York	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$4.50	$5.50	$4.50	$4.55	$5.90	$7.00
Cone Head Boiler						
¾ in. and larger	4.60	5.60	4.60	4.65	6.00	7.10
⅝ and ⅞	4.75	5.75	4.75	4.80	6.15	7.25
½ and ⅝	5.10	6.10	5.10	5.15	6.50	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in and 2 in. take an extra of 25c.

Track Supplies—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Mill, Pittsburgh: Feb. 27, 1917	Mill, Pittsburgh: One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes	$3.40	$2.35	$4.00	$4.15	$5.00
Track bolts	4.85@5.00	2.60	5.50	Premium	5.35
Standard section angle bars	2.25@2.75	1.50@1.75	3.50	Premium	4.75

Nails—The following quotations are per keg from warehouse:

	New York: Feb. 27, 1917	New York: One Year Ago	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.65	$2.70	$3.50	$3.66	$3.45	$4.05
Cut	3.85	2.70	3.90	....	3.65	5.00

Bars, Concrete Reinforcing—The following quotations are per 100 lb.:

BILLETS

In.	Mill Shipment	Warehouse: New York Feb. 27, 1917	New York One Month Ago	St. Louis	Chicago	Dallas	San Francisco
¾ and larger	$3.00	$4.10	$3.95	$3.34	$3.75	$4.25	$4.35
⅝	3.05	4.20	4.05	3.39	3.80	4.30	4.45
½	3.10	4.30	4.15	3.44	3.85	4.35	4.55
⅜	3.25	4.45	4.35	3.59	4.00	4.50	4.85
¼	3.50	4.80	4.70	3.84	4.50	4.75	5.35

RAIL

	St. Louis	Dallas		St. Louis	Dallas
¾ and larger	$3.00	$4.25	⅝	$3.25	$4.50
⅝	3.05	4.30	¼	4.00	....
½	3.10	4.35			

Chain—Quotations below are per 100 lb.:

	New York: Feb. 27, 1917	New York: Six Months Ago	Chicago	St. Louis	San Francisco	Dallas
⅜	$11.00	$10.10	$10.40	$12.50	$14.00	$15.00
¼	8.55	7.55	7.85	9.00	10.25	11.25
5/16	7.55	6.55	6.85	7.50	9.00	10.25
⅜	7.00	6.00	6.30	6.75	8.50	9.25
7/16	6.80	5.80	6.15	6.65	8.25	8.75
½ and 9/16	6.60	5.60	6.00	6.50	8.00	8.50
5/8 and 11/16	6.50	5.50	5.90	6.40	7.75	8.50
¾ and 13/16	6.35	5.40	5.80	6.25	7.75	....
7/8 and 15/16	6.30	5.30	5.70	6.15	7.60	....
1	6.20	5.20	5.60	6.00	7.50	....
1⅛ and 1¼	6.30	5.30	5.70	6.10	7.60	....

EXTRAS TO ABOVE LIST PER 100 LB.

	For BB	For BBB
⅛ in. and ¼ in.	$1.50	$2.00
⅜ in. and larger	1.25	1.75

Sheets—Quotations are in cents per pound in various cities from warehouse, also the base quotation from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York	Dallas*
No. 10	4.65	5.30	5.25	6.25	5.25	5.25
No. 12	4.60	5.35	5.30	6.25	5.30	5.30
No. 14	4.50	5.40	5.35	6.25	5.35	5.35
Black						
Nos. 18 and 20	4.70	5.50	5.20	7.20	5.70	5.30
Nos. 22 and 24	4.85	5.55	5.25	7.30	5.85	5.35
No. 26	4.90	5.60	5.30	7.40	5.90	5.40
No. 27	4.95	5.65	5.35	7.50	5.95	5.45
No. 28	5.00	5.70	5.40	7.60	6.00	5.50
Galvanized						
No. 10	5.50@5.75	Premium	6.70	...	6.30	6.25
No. 12	5.60@5.85	Premium	6.70	7.74	6.45	6.35
No. 14	5.60@5.85	Premium	6.70	7.74	6.60	6.35
Nos. 18 and 20	5.90@6.15	Premium	6.90	8.04	6.90	6.65
Nos. 22 and 24	6.05@6.30	Premium	7.05	8.18	7.05	6.80
No. 26	6.20@6.45	Premium	7.20	8.33	7.20	6.95
No. 27	6.25@6.50	Premium	7.35	8.48	7.35	7.10
No. 28	6.50@6.75	Premium	7.50	8.62	7.50	7.25

*These prices are for all-rail; ocean-and-rail rate about 9c. less.

Structural Material—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York: Feb. 27, 1917	New York: 6 Mo. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.30	$4.10	$3.25	$4.05	$4.00	$4.75	$4.50
Channels, 3 to 15 in.	3.25	4.00	3.25	4.05	4.00	4.75	4.50
Angles, 3 to 6 in., ¼ in. thick	3.25	4.00*	3.25	4.05	4.00	4.75	4.50
Tees, 3 in. and larger	3.25	4.00	3.30	4.05	4.05	4.75	4.50
Plates	3.60	5.15	4.00	4.80	4.75	6.00	5.50

New York extras on other shapes and sizes in cents per lb. are as follows:

I-beams over 15 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick	.70
Cutting to lengths, under 2 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge is made for cutting to lengths 3 ft. and over.

Cast-iron Pipe—The following are prices per net ton for carload lots:

	New York: Feb. 27, 1917	New York: One Year Ago	Birmingham	Chicago	St. Louis	San Francisco	Dallas
4 in.	$44.50	$31.50	$39.00	$44.15	$43.00	$52.00	$47.00
6 in. and over	41.50	29.50	36.00	41.15	40.00	49.00	44.00

Gas pipe and 16-ft. lengths are $1 per ton extra.

Triangle Mesh—Price per 100 sq.ft. for 4-in. mesh in carload lots:

Style No. and Longitudinal Sectional Area Sq In. per Ft. Width	Plain—New York	Plain—Chicago	Galvanized New York
0.032	$0.85	$0.89	$0.96
0.040	.96	1.01	1.09
0.049	1.08	1.13	1.22
0.058	1.23	1.29	1.39
0.068	1.35	1.42	1.52
0.080	1.54	1.62	1.74
0.093	1.73	1.82	1.96
0.107	1.93	2.02	2.18
0.126	2.19	2.30	2.48
0.146	2.50	2.62	2.83
0.153	2.62	2.75	2.96
0.168	2.85	2.99	3.22
0.180	3.00	3.15	3.39
0.208	3.43	3.60	3.87
0.245	3.97	4.16	4.48
0.267	4.27	4.48	4.83
0.287	4.58	4.80	5.18
0.309	4.93	5.17	5.57
0.336	5.31	5.57	6.00
0.365	5.74	6.02	6.48
0.395	6.16	6.46	6.96
	PAVING		
0.036	.65	....	.74
0.044	.77	....	.87
0.053	.92	....	1.04
0.062	1.04	....	1.17
0.072	1.19	....	1.35
0.084	1.35	....	1.52
0.097	1.54	....	1.74
0.041	.81	....	.91
0.049	.92	....	1.04
0.058	1.08	....	1.22
0.067	1.19	....	1.35
0.077	1.35	....	1.52
0.089	1.54	....	1.74
0.102	1.69	....	1.91

Made regularly in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. lengths of 150, 200 and 300 ft.

Old Material—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis and vicinity, the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York—Feb. 27, 1917	New York—One Month Ago
Heavy melting steel scrap	$19.50@20.00	$17.50@18.00
No. 1 railroad wrought	22.00@23.00	22.00@23.00
Stove plate	14.00@14.50	14.00@14.25
No. 1 machinery cast	21.00@21.50	18.50@19.00
Machine shop turnings	11.00@11.50	9.50@10.00
Cast borings	12.00@12.50	10.50@11.00
Railroad malleable cast	19.00@19.50	18.00@18.50

	Chicago—Feb. 27, 1917	Chicago—One Month Ago
No. 1 railroad wrought	$24.00@25.00	$23.50@24.00
Stove plate	12.00@12.50	11.50@12.00
No. 1 machinery cast	15.25@16.25	15.50@16.50
Machine shop turnings	9.25@ 9.75	9.25@ 9.75
Cast borings	9.25@ 9.75	9.00@ 9.50
Railroad malleable cast	17.25@17.75	17.50@18.00

	St. Louis—Feb. 27, 1917	St. Louis—One Month Ago
Heavy melting steel scrap	$22.00@22.50*	$22.00@22.50*
No. 1 railroad wrought	24.00@24.50†	22.50@23.00†
Stove plate	11.50@12.00†	12.00@12.50†
No. 1 machinery cast	14.50@15.00†	15.00@15.50†
Machine shop turnings	9.25@ 9.75†	9.50@10.00†
Cast borings	8.50@ 9.00†	8.00@ 8.50†
Railroad malleable cast	15.75@16.25†	16.50@17.00†

*Gross ton. †Per net ton.

Wire Rope—Discounts from list price on bright and galvanized are as follows:

	New York—Feb 27, 1917	New York—One Year Ago	St. Louis	Chicago	Dallas	San Francisco
Galvanized	15-2½%	27½-2½%	15-2½%	15-2½%	12½-12½-5%	25%
Bright	25-2½%	37½-2½%	25-2½%	25-2½%	22½-12½-5%	15%

At this rate the net prices in New York for galvanized, 7 wires to strand, are as follows per 100 ft.:

Diameter, In.		Diameter, In.	
½	$4.40	1¼	$18.30
⅝	5.90	1⅜	20.80
¾	6.60	1½	25.60
⅞	9.50	1⅝	27.80
1	11.00	1¾	32.20

Expanded Metal Lath—Prices per 100 yd. for painted are as follows:

Gage	Weight	New York—Carload	New York—Less Than Carload	Chicago	St. Louis	San Francisco	Dallas
27	233	$20.94	$21.02	$21.00	$21.00	$21.00	$20.00
26	250	21.97	22.05	22.00	22.00	22.25	....
25	300	23.07	23.16	23.00	....	....	....
24	340	24.14	24.25	24.00	24.00	25.00	24.00
22	450	26.33	26.47	26.00	....	30.00	....

About 10% additional for smaller quantities. For galvanized add 8c., and 3½c. for toncan.

Steel Sheet Piling—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Feb. 27, 1917	One Month Ago	One Year Ago
$3.50	$3.00	$2.25

Freight Rates—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except polished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Baltimore	15.40	Minneapolis	32.5
Boston	18.90	New Orleans	30.7
Buffalo	11.60	New York	16.8
Chicago	18.90	Pacific Coast (all rail)	65.0
Cincinnati	15.80	Philadelphia	15.8
Cleveland	10.50	St. Louis	23.6
Denver	68.60	St. Paul	32.5
Kansas City	43.60		

Steel Rails—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh	Chicago
Standard bessemer rails	$38.00	$38.00
Standard openhearth rails	40.00	40.00
Light rails, 8 to 10 lb.	53.00	47.00
Light rails, 12 to 14 lb.	52.00	46.00
Light rails, 25 to 45 lb.	50.00	44.00

CEMENT, BRICK AND STONE

Paving Stone—

New York	Manhattan	$2.40	sq yd
	Other boroughs	2.20	sq yd
Chicago	About 4x8x4 dressed	2.15	sq yd
	About 4x8x4 common	1.75	sq yd
San Francisco	Basalt block 4x7x8	57.75	per M

Flagging—

New York	Bronx	$0.17	sq ft
	Manhattan	.17	sq ft
	Queens, 5 ft. square	.18	sq ft
Chicago	18 in. wide	.60	lin ft

Curbing—Prices per linear foot are as follows:

New York	5x16	$0.40
	5x20	.45
Chicago	6x18	.45
St. Louis	5x16	.68
San Francisco	5x16	.75
	5x20	.85

Brick—The price per 1,000 in cargo or carload lots is as follows:

	Common	Paving—Brick	Paving—Block
New York	$9.50	$23.00	$31.00
Chicago	6.00	16.00	24.00
St. Louis, salmon	7.00	....	....
St. Louis, selected	10.00	....	18.00
San Francisco	10.00	....	....

Sand and Gravel—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel	1½ In. Feb. 27, 1917	1½ In. One Year Ago	¾ In. Feb. 27, 1917	¾ In. One Year Ago	Sand Feb. 27, 1917	Sand One Year Ago
New York	$1.25	$1.20	$0.80	$1.25	$0.85	$0.50	$0.45
Chicago	1.25	1.25	1.15	1.25	1.15	.96	.85
St. Louis	....	.70	.70	.70	.70	.60	.60
San Francisco	2.00	1.00	1.00	1.00	1.00	1.00	1.15
Dallas	....	1.10	....	1.10	....	1.35	....

St. Louis—Fine white sand:

Pacific	$3.50 ton	Ottawa	$5.00 ton

Crushed Stone—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Feb. 27, 1917	1½ In. One Year Ago	¾ In. Feb. 27, 1917	¾ In. One Year Ago
New York	$1.10	$0.85	$1.20@1.30	$0.95
Chicago	1.25	1.15	1.25	1.15
St. Louis	1.25	.81	1.25	.81
San Francisco	1.00	1.15	1.00	1.15
Dallas	1.36 ton		1.49 ton	

Portland Cement—These prices are for barrels in carload lots including bags:

	Feb. 27, 1917	One Month Ago	One Year Ago
New York	$1.97	$1.97	$1.27
Jersey City	1.85	1.85	1.21
Boston	2.17	2.17	1.47
Chicago	2.06	1.96	1.36
Pittsburgh	2.06	2.06	1.36
Cleveland	2.19	2.19	1.50
Detroit	2.15	2.15	1.45
Indianapolis	2.19	2.13	1.49
Toledo	2.19	2.15	1.49
Milwaukee	2.18	2.08	1.48
Minneapolis	2.33	2.23	1.63
Duluth	2.31	2.21	1.56
Peoria	2.18	2.08	1.44
Cedar Rapids	2.29	2.19	1.55
Davenport	2.24	2.14	1.45
St. Louis	1.95	1.95	1.40
San Francisco	2.30	2.30	1.90

Rosendale Cement—Price to dealers for 500 bbl. or over, f.o.b., including bags:

New York	$1.00

30c. allowed for bags.

MISCELLANEOUS

Wood Block Paving—

Chicago—4 in. block 16 lb. treatment	$1.60 sq.yd.
Chicago city specification	2.05 sq.yd.
St. Louis—4 in. block 16 lb. treatment	1.55 sq.yd.
Dallas—4 in. block 16 lb. treatment	1.94 sq.yd.

Lumber—Price per M in carload lots:

Square Edge and Sound Green

Southern Pine—New York:

	20 Ft. and Under	22-24 Ft.	26 Ft.	28 Ft.	30 Ft.	32 Ft.
3x 4 to 8x 8.....	$29.00	$30.00	$31.00	$31.00	$32 00	$32.00
3x10 to 10x10.....	30.00	31.00	32.00	32.00	33.00	33.00
3x12 to 12x12.....	35.00	36.00	37.00	37.00	38.00	38.00
3x14 to 6x14.....	37.00	38.00	39 00	39 00	40.00	40.00
7x14 to 14x14.....	37.00	38.00	39.00	39.00	40.00	40.00
3x16 to 6x16.....	39.00	40.00	42.00	42.00	44.00	44.00
7x16 to 16x16.....	39.00	40.00	42.00	42 00	44 00	44.00
3x18 to 8x18.....	43.00	44.00	46.00	46.00	48.00	48.00
9x18 to 18x18.....	43.00	44.00	46 00	46 00	48.00	48.00
4x20 to 20x20.....	47.00	48.00	50.00	50.00	52.00	52.00

Southern Pine—Chicago:

3x 4 to 8x 8.....	27.00	28.00	29.00	29.00	30 00	30 00
3x10 to 10x10.....	28.00	30.00	30.00	30.00	31.00	31.00
3x12 to 12x12.....	32.00	33.00	34.00	34.00	35.00	35.00
3x14 to 6x14.....	34.00	35 00	36 00	36.00	37.00	37 00
7x14 to 14x14.....	34.00	35.00	36.00	36.00	37.00	37.00
3x16 to 6x16.....	36.00	37.00	39.00	39.00	41.00	41.00
7x16 to 16x16.....	36.00	37.00	39.00	39.00	41 00	41 00
3x18 to 8x18.....	40.00	41.00	43.00	43.00	45.00	45.00
9x18 to 18x18.....	40.00	41.00	43.00	43.00	45.00	45.00
4x20 to 20x20.....	44.00	46.00	46.00	47.00	49.00	49.00

Yellow Pine—St. Louis:

	20 Ft.	22 and 24 Ft.	26 Ft.	28 Ft.	30 Ft.	32 Ft.
3x 4 to 8x 8.....	$21.00	$22.00	$23 00	$24.00	$25.00	$26.00
3x10 to 10x10.....	22.00	23.00	24.00	25.00	26.00	27.00
3x12 to 12x12.....	23.50	24 50	25.50	26.50	27.50	28.50
3x14 to 6x14.....	25.00	26.00	27 00	28 00	29.00	30.00
7x14 to 14x14.....	25.00	26.00	27.00	28.00	29.00	30.00
3x16 to 16x16.....	27.00	28.00	29.00	30.00	31.00	32.00
7x16 to 16x16.....	27 00	28,00	29.00	30.00	31 00	32 00
3x18 to 8x18.....	29.00	30.00	31.00	32.00	33 00	34.00
9x18 to 18x18.....	29.00	30.00	31.00	32.00	33.00	34.00
4x20 to 20x20.....	33.00	34.00	35 00	36 00	37.00	38.00

Over 32 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12x12 and under; for sizes over 12x12 add $2. For merchantable add $2 to sizes 10x10 and under. For prime add $2 to the price of merchantable for all sizes.

Yellow Pine—Dallas. Price per M:

No. 1 Common			
2x4—12, 14 or 16 ft.....	$25.00	2x10—12, 14 or 16 ft.....	$25.00
2x4—10, 18 or 20 ft.....	28.00	2x10—10, 18 or 20 ft.....	27.50
2x4—22 or 24 ft.....	30.00	2x10—22 or 24 ft.....	30.00
2x6—10 to 20 ft.....	24.00	2x12—same as 2x4	
2x6—22 or 24 ft.....	26.00	4x4, 4x6, 6x6.....	28.50
2x8—12, 14 or 16 ft.....	25.00	3x8, 6x8, 8x8.....	29.50
2x8—10, 18 or 20 ft.....	27.00	3x10, 8x10, 1010.....	30.00
2x8—22 or 24 ft.....	28.00	3x12, 12x12	32.50

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft.
3 and 4x4.....	$16.00	$17 50	$19.00
3 and 4x6 and 8.....	16.00	16.50	17.50
6x6 to 8x8.....	16.50	17.50	17.50
3 and 4x10.....	16 00	17.50	18.50
6 and 8x10.....	17.00	18.00	18.00
10x10	17.00	17 00	19.00
3 and 4x12.....	16.00	17 50	18.50
6 and 8x12.....	17.50	18.50	18.50
10 and 12x12.....	17.00	17.00	19 00
3 and 4x14.....	17.00	19.00	20.00
6 and 8x14.....	18.50	19 50	19.50
7 and 9x14.....	19.50	20 50	20.50
10 and 12x14.....	18.00	18.00	20.00
14x14	17.00	17.00	19.00
3 and 4x16.....	18.00	20.50	21.50
6 and 8x16.....	20.00	21 00	21.00
7 and 9x16.....	21.00	23 00	23.00
10 and 12x16.....	19.00	19.00	21.00
14 and 16x16.....	17.00	17.00	19 00
3 and 4x18.....	19.00	22.00	24.00
6 and 8x18.....	20.50	23 00	23.00
7 and 9x18.....	21.50	24 00	24.00
10 and 12x1[illegible].....	20.00	20.00	22.00
14 and 16x18.....	18 00	18.00	20.00
18x18	19.00	19.00	21.00
3 and 4x20.....	21.00	23 50	25.50
6 and 8x20.....	22.50	25 00	25.00
10 and 12x20.....	21.00	21.00	23.00
14 and 16x20.....	19.00	19.00	21 00
18 and 20x20.....	20.00	20.00	22.00

Poles—The prices on Western red cedar poles, effective Dec. 21, 1916:

	New York	Chicago	St. Louis	Denver
6 in. by 30 ft.....	$5.24	$4 59	$4.59	$3.87
7 in. by 30 ft.....	6.90	6.10	6.10	5.30
7 in. by 35 ft.....	9.70	8 60	8 60	7.55
8 in. by 35 ft.....	11.20	9.90	9.90	8.65
7 in. by 40 ft.....	11.35	10.00	10 00	8.75
8 in. by 40 ft.....	12.75	11.15	11.15	9 65
8 in. by 45 ft.....	15 70	13.70	13 70	11.80
8 in. by 50 ft.....	18.35	15.95	15.95	13.65

Railway Ties—For fair-size orders, the following prices per tie hold:

	Material	7 In by 9 In. by 8 Ft. 6 In.	6 In. by 8 In by 8 Ft.
New York.....	Yellow Pine	$1.15@1.20	$1.06@1.11
St. Louis.....	White Oak	.72	.61
Chicago.....	.....	.95	.85
San Francisco.....	Douglas Fir Green	.83	.55
San Francisco.....	Creosoted	1.43	.98

Sewer Pipe—The following prices are in cents per foot for carload lots:

Size, In.	New York Feb. 27, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	.081	....	....	075	.06	.0888
4	.081	....	....	075	08	.0888
5	.1215	....	....	1125	10	.1332
6	.1215	075	10	1125	12	.1332
8	189	122	14	175	.18	.1975
10	.2835	165	195	.2625	.27	.2765
12	.3645	.205	28	.3375	.3375	.3555
15	486	.30	42	.46	....	.5135
18	675	.45	64	625	675	.6715
20	.81	.612	.7625	75	.875	.7900
22	$1.08	735	975	$1.00	$1 05	$1.027
24	1.215	875	$1.10	1.125	1.25	1.185
27	1.82	1.30	1.30	....	....	....
30	2.016	1.70	1.70	....	....	....
33	2 70	2.25	2.25	....	....	....
36	3.075	2.50	2.50	....	....	....

Hollow Tile—Hollow building tile price per block in cents:

	New York	Chicago	St. Louis	San Francisco	Dallas
4x12x12 in.	.09	.06845	054	.07	.07
6x12x12 in.	126	.10265	066	.095	.09
8x12x12 in.	.153	1186	09	.12	.12
10x12x12 in.	.18	.13685	15	.18	.15
12x12x12 in.	225	.1779	.18	.20	.18

Fireproof partition blocks price per block in cents:

2x12x12 in	.076	.074	....	.055	.06
3x12x12 in.	.076	.074	....	.065	.06
4x12x12 in.	.086	.05055	....	.07	07
6x12x12 in.	114	.0695	....	.095	09
8x12x12 in.	.152	.09475	....	.12	12

Above prices are for carload lots or more.

Asphaltum—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Mexican	$19.00	$14.00
Chicago	Mexican	22.00	18.00
St. Louis	Texas or Mexican.....	18.00	....
San Francisco	California	13.50	12.00
Dallas	Texas or Mexican.....	19.00	....

Road Oils—Following are prices in tank cars 8000 gal minimum f.o.b. place named:

New York, 40-50% asphalt.....	6⅝c. gal
New York, 60-70% asphalt.....	6¾c. gal.
St. Louis	6c. gal
Chicago, 15-20% asphalt.....	6½c. gal.
Dallas, 40-50% asphalt.....	4c. gal
Dallas, 60-70% asphalt.....	6c gal
San Francisco; 75-95% asphalt, 42 bulk gal.....	$1.85 bbl.

Flue Lining—Price per foot in carload lots:

	New York	Chicago	St. Louis	San Francisco	Dallas
4½x 8½ in.	$0.099	$0.12	$0.165	$0.12	$0 093
4½x13 in.	.132	.16	.225	.18	.155
8 x 8½ in.	.132	.16	.21	.16	.155
8½x13 in.	.198	.20	27	.22	.217
8½x13 in.	.297	.32	42	.36	.3015
13 x1[illegible] in.	.385	42	.60	.40	.3685
18 x1[illegible] in.	.495	.55	90	.60	.5025

Clay Drain Tile—The following prices are per 1,000 lin ft.:

Size, In.	New York Feb. 27, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$24.90	$22.50	$18.40	$15 00	$24.50	$19.80
4	33.85	32.50	20.70	18 00	31.50	28.10
5	47.00	47.50	28.75	23.00	45 50	....
6	59 00	57.50	40.25	27.00	63.00	45.95
8	100.10	97.50	74.75	55.00	105.00	82.75

Lime—The following prices per ton prevail:

	Hydrated	Common
New York, on job.....	$16.50	$13.25
San Francisco, warehouse.....	17.00	13 50
Chicago, warehouse	15 00	12.00
Dallas, warehouse	18.50	13 50

MISCELLANEOUS METALS

Miscellaneous Metals—The present quotations in cents per pound with a comparison of practically a month and a year ago are as follows:

	New York Feb. 27, 1917	One Month Ago	One Year Ago
Copper, electrolytic (carload lots)...	27 00	33.00	27.25
Tin	49.00	45.00	50.00
Lead	10 50	8.00	6.50
Spelter	12.00	10.00	21.12½
ST. LOUIS			
Lead	10.00	8.00	6 35
Spelter	10.75	9.75	21.00

Old Metals—The following are the dealers' purchasing prices in cents per pound:

	New York Feb. 27, 1917	New York One Year Ago	Cleveland
Copper, heavy and crucible.....	28 00	24.00	28.00
Copper, heavy and wire.....	27.00	23 00	27.50
Copper, light and bottoms.....	24 00	20.00	26.00
Lead, heavy	7.25	5.25	8.25
Lead, tea	6.75	4.75	6.00
Brass, heavy	17.00	14.50	18 00
Brass, light	13.50	12 00	13.50
No. 1 yellow rod brass turnings.....	18.00	14 00	17 00
Zinc	7.50	14.00	8.50

RAILWAYS—STEAM AND ELECTRIC

Proposed Work

Massachusetts—Holyoke St. Railway Co., Holyoke, granted franchise by Council to build extension along West Main St. to Canal St., Canal to Taylor St. and Taylor to West Main St. L. D. Peillisier, Holyoke, Gen. Mgr. and Pur. Agt. Noted Dec. 2.

New Jersey—Jersey Central Traction Co., Perth Amboy, plans to extend system to northwest section of city near Hall and Amboy Ave. T. W. Wilson, 603 Market St., Wilmington, Del., Gen. Mgr.

New Jersey—Public Service Railway Co. plans line on Ave. R, Newark. R. E. Danforth, Public Service Bldg., Newark, Gen. Mgr.

New Jersey—Public Service Railway Co., of Newark, plans to extend system in northwest section Perth Amboy. R. E. Danforth, Public Service Bldg., Newark, Gen. Mgr.

New Jersey—West Jersey & Seashore R.R., (steam and electric branch Pennsylvania R.R.), granted permission new line from Market St. to point near Arch St., Camden. J. Buckelew, Camden, Supt.

Pennsylvania—Waynesburg & Washington R.R. (Pennsylvania R.R. owner), plans to extend line from Besco to Clarksville thence to Marianna and up valley of south branch Ten Mile Creek to Waynesburg. A. C. Shand, Phila., Ch. Engr.

Maryland—Cumberland Valley R.R. made surveys freight line from Maugansville to Potomac River. T. R. Kennedy, Chambersburg, Pa., Ch. Engr. Noted Jan. 18.

Maryland—Kentucky-Southeastern Ry. plans line from Indian Head to Cumberland River, McCreary County, Ky., thence south via Bear Creek Junction, Tenn., to mouth Bear Creek, about 25 mi. Plans include 1 steel bridge and 2 tunnels. L. E. Bryant, Roberta, Tenn., Ch. Engr.

Virginia—Virginia Railway and Power Co., Richmond, plans to double-track and improve its lines. C. B. Buchanan, 7th and Franklin St., Richmond, Gen. Mgr.

West Virginia—Baltimore & Ohio Railroad Co. plans line from Sago to connect with Coal and Coke Railway at Hampton. About $100,000. R. N. Begien, Baltimore, Ch. Engr.

West Virginia—Kanawha & Michigan Ry. made preliminary surveys line from Blakely up Gulley River, about 20 mi. A. N. Lyon, Charleston, Gen. Supt. Noted Nov. 9.

West Virginia—Pennsylvania Lines West of Pittsburgh, Southwest System, plans to improve tracks and yards near Glenn's Run and New Cumberland Junction. W. C. Cushing, Pittsburgh, Ch. Engr.

North Carolina—Piedmont Railway and Electric Co. making surveys extension trolley line from Burlington to Hopedale, 3 mi. G. W. Hatch, Burlington, Supt.

South Carolina—Charleston & Western Carolina Ry. plans extra trackage and "Y" at Spartanburg. A. H. Porter, Augusta, Ch. Engr.

Georgia—Americus & Atlantic R.R. making surveys extending line from Byromville to Americus, about 15 mi. J. S. Morton, Byromville, interested.

Georgia—Bibb Belt Line Railroad Co., Macon, will be incorporated to build railway from connection with Macon, Dublin & Savannah R.R. near Ocmulgee River to connection with Central of Georgia Ry. near Rivoli, Bibb County. W. B. Sparks, J. T. Moore and others, Macon, interested.

Alabama—Alabama Power Co. plans to rebuild line from Anniston to Oxford Lake, laying new ties and 56-lb. rails. F. H. Chamberlain, Brown-Marx Bldg., Birmingham, Gen. Mgr.

Mississippi—H. Weston Lumber Co., Logtown, plans to extend logging railway to Ansley, about 10 mi., to connect with Louisville & Nashville R.R.

Kentucky—L. E. Bryant, Roberta, Tenn., Mgr. Kentucky Southeastern R.R., announced that line from mouth Branch Creek, Kentucky, to connection with Queen & Crescent route in Tennessee will be built this year.

Ohio—Bay Terminal R.R. plans to spend $200,000 improving system in Toledo. R. C. Pew, Toledo, Pres., Treas, and Gen. Mgr.

Indiana—Evansville & Indianapolis Railroad Co. applied to Council, Terre Haute, franchise to improve and extend trackage for terminal facilities preparatory to building new freight and passenger depot. About $100,000. C. B. Falley, Terre Haute, Supt.

Kansas—Seward County, Liberal, election Mar. 6 to vote on bonds to aid construction of Colorado, Kansas & Oklahoma R.R. from Scott City, Kan., to Forgan, Okla. B. L. Allen, Russell Springs, Okla., Ch. Engr. Noted Dec. 28.

Missouri—Chicago, Burlington & Quincy Ry. soon receives bids grading line from Monroe City to Moberly, about 46 mi. Plans include 600-ft. steel trestle over Salt River near Stoutsville and bridge same length over Middle Fork Salt River near Holliday. W. L. Breckenridge, Chicago, Ch. Engr. Noted Dec. 21.

Arkansas—Coal District Power Co., Ft. Smith, recently organized, plans to build and operate electric street railway and interurban lines in Ft. Smith, also produce and distribute electric current for light, heat and power. Company also plans interurban line between Greenwood, Huntington, Mansfield, Hartford and Booneville. A. Emanual, Schwind Bldg., Dayton, Ohio and H. Means, Ft. Smith, interested.

Arkansas—Louisiana & Pine Bluff Ry. making surveys extension from Pollar Junction to Galion, about 35 mi. W. H. Lee, Huttig, Ch. Engr.

Texas—Bryan & Central Texas Interurban Ry. soon lets contract line from Whittaker to Wilcox, about 7 mi. L. M. Levenson, Bryan, Gen. Mgr. Noted Dec. 7.

Texas—Jefferson & Northwestern Railway Co. plans line from Camp to Marietta, about 6 or 7 mi. H. B. Montgomery, Jefferson, Ch. Engr.

Oklahoma—Clinton, Oklahoma & Western Ry. making preliminary surveys line from Clinton to Colony, about 7 mi. W. S. Haid, Clinton, Gen. Mgr., Treas. and Pur. Agt.

Washington—Northern Pacific Ry plans to lay 20 mi. of 90-lb. rails on main line from Auburn to Eagle Gorge; also raise railway grade near Shoskin from 4 to 6 ft. H. E. Stevens, St. Paul, Ch. Engr.

Oregon—H. B. A. Logging Co., St. Helens, plans 4 mi. logging railway from Loomis Crossing on St. Helens Lumber Co.'s line to timber holdings. Address W. Holland, St. Helens.

British Columbia—Canadian Northern Ry System, Lines West of Port Arthur, plans line through New Westminster. M. H. MacLeod, Winnipeg, Man., Ch. Engr. and Gen. Mgr.

Bids In and Contracts Awarded

Tennessee—Gulf, Mobile & Northern Ry. let contract extension from Middleton to Jackson, about 20 mi., to M. A. WOGAN, 1229 First National Bank Bldg., Denver. Noted Feb. 1.

Oklahoma—Atchison, Topeka & Santa Fe Ry. let contract grading change line near Purcell to CAMERON, JOYCE & CO., Kansas City, Mo.

LIGHT, HEAT AND POWER

Proposed Work

Ct., Middletown—Franklin Electric Co. will extend plant on Hamlin St.

N. Y., Geneva—City plans installing electric-light plant.

N. Y., Jay—Paul Smith's Electric Light, Power and Railroad Co., Saranac, applied to Pub. Ser. Comn. permission to install electric-distributing system. P. Smith, Pres.

N. Y., Newport—Newport Electric Light and Power Co. will extend transmission lines. G. T. Woodlin, Treas.

N. Y., New York—(Manhattan)—(Official)—New York Central Railroad Co., 45th St. and Lexington Ave., made plans heating plant 43rd St. and Lexington Ave. About $175,000. J. G. Wise, Grand Central Terminal, Arch.

N. Y., New York—(Manhattan)—Dept. Health made plans 1-story, 47x104-ft. boiler house. H. Emerson, Center and Walker St., Comr. W. E. Austin, 46 West 24th St., Arch.

N. J., Bayonne—Public Service Electric Co. plans addition at 36th St. and Broadway. N. A. Carle, Newark, Ch. Engr.

Pa., Yorkhaven—Yorkhaven Water and Power Co. plans dam across eastern channel of Susquehanna River.

Ga., Statesboro—See item under "Streets and Roads."

Ga., Unadilla—City plans electric-light system.

Ala., Birmingham—City plans $500,000 bond issue to install electric-light plant.

La., Monroe—City will vote Mar. 20 on $61,000 bonds to build power house and rebuild electric generating plant. W. G. Kirkpatrick, Jackson, Miss., Engr. Noted Jan. 18.

Tenn., Kingsport—See item under "Water-Works."

Ky., Cave City—Kentucky Utilities Co. of Louisville plans electric transmission system from Glasgow to Cave City and Horse Cave. A. Boyd, Local Supt.

Ohio, Delphos—Northwestern Ohio Light and Power Co., Van Wert, made plans substation and power house. About $20,000. W. P. Hurd, Engr.

Ohio, Lancaster—State Legislature appropriated $100,000 for power house at Boys' Industrial School.

Ohio, Leipsic—Northwestern Ohio Light Co. will install power plant. About $40,000. Plant will supply electricity to Hamler and Oakwood.

Ohio, Warren—City plans electric-light plant.

Ohio, Youngstown—Youngstown & Sharon St. Railway Co. plans electric-light plant. E. H. Bell, Youngstown, Mgr. Lighting.

Mich., Detroit—Detroit Edison Co. plans 6-story heating plant, 91-105 West Congress St. About $156,000.

Mich., Lowell—City making plans addition to electric-light plant. F. S. Williams, Ann Arbor, Engr.

Wis., Amberg—City plans hydro-electric power plant to supply city and neighboring towns with light and power.

Wis., Osceola—Osceola Mill and Elevator Co. made plans hydro-electric power plant. Power Engineering Co., Corn Exchange, Minneapolis, Engr.

Wis., Union Grove—Union Grove Electric Light and Water Co., recently destroyed by fire, will be rebuilt. W. Hardy, Owner.

Ia., Cumberland—City voted bonds to install electric-light plant.

Ia., Grinnell—Grinnell College making plans addition to power plant. Pillsbury Engineering Co., Metropolitan Bldg., Minneapolis, Engr.

Minn., Benson—City making plans remodeling electric-light plant. W. E. Skinner, 714 Plymouth Bldg., Minneapolis, Consult. Engr.

Minn., Emmons—City plans electric-light plant E. D Jackson, Capitol Bank Bldg., St. Paul, Consult. Engr.

Kan., Bronson—City will vote in April on $15,000 bonds to install electric-light plant. W. B. Rollins Co., 209 Railway Exchange Bldg., Kansas City, Engr. Noted Feb. 8.

Kan., Osage—City plans transmission line from electric-light plant to Allen and Admira.

Kan., Yates Center—City plans $30,000 bond issue to install electric-light plant.

S. D., Bruce—City sold $7000 bonds to install electric-light plant. Noted Nov. 9.

Mont., Scobey—See item under "Water-Works."

Mo., Kansas City—Kansas City Light and Power Co. making plans electric generating plant. J. H. Lucas, Pres.

Mo., Marshall—City plans electric-light plant. About $75,000. Henrici, Kent & Lowry, 222 Commerce Bldg., Kansas City, Engr.

Mo., Poplar Bluff—City will issue $10,000 bonds to install electric-light system.

Mo., Springfield—Federal Light and Traction Co. will build additional plant. About $250,000. Sanderson & Porter, 52 William St., New York, Engr. A. F. Van Deinse, Local Mgr.

Okla., Billings—See item under "Water-Works."

Okla., Billings—City making plans electric-light plant, water and sewer system. About $50,000. Election soon to vote on bonds. Mackintosh Walton Engineering Co., 1023 State National Bank Bldg., Oklahoma, Engr. Noted Feb. 22.

Okla., Frederick—See item under "Water-Works."

Okla., Kaw City—(Official)—City receiving bids Mar. 9 electric-light plant. About $10,000. Benham Engineering Co., Colcord Bldg., Oklahoma, Engr. Noted Feb. 8.

Okla., Lawton—Night and Day Oil Co. will rebuild power plant and pumping station destroyed by fire.

Calif., Chico—City made plans electric-light plant on Deer Creek owned by D. Murphy. About $577,536. C. M. Burleson, 785 Market St., San Francisco, Consult. Engr. Noted Jan. 11.

Calif., Hanford—Hanford Gas and Power Co. plans to improve system and install new machinery. Estimated cost, $30,000.

Ont., Delaware—City voted in favor of by-law to install hydro-electric system. About $50,000.

Ont., London—See item under "Industrial Work."

Man., Winnipeg—City will extend Point du Bois power plant. About $150,000. A. Sparling, Chn Electr. Dept.

Bids In and Contracts Awarded

Mich., Mt. Clemens—Mt. Clemens Gas Light Co. let contract rebuilding plant to J. S. PAGANETTI, 129 South Front St., $25,000. Noted Nov. 23.

Kan., Wichita—City let contract heating system in new high school to R. R. MOORE PLUMBING AND HEATING CO., $8595.

Ark., Dumas—Imprv. Dist. No. 2 let contract electric-light plans to J. L. V. GRENIER CO. Noted Nov. 9.

Okla., Alva—See item under "Industrial Works."

Okla., Strong City—City let contract electric-light plant to F. WALKER.

Calif., Anaheim—Southern California Edison Co. let contract rein.-con. substation to WILLARD BRENT CO., Baker-Detwiller Bldg., Los Angeles. About $10,000.

BRIDGES

Proposed Work

N. Y., Massena—(Official)—Town retained Concrete-Steel Engineering Co., Park Row Bldg., New York, to make plans bridge over Grasse River on Main St., concrete steel arch. About $75,000 bonds voted for work.

Del., Edgemoor—Pennsylvania R.R. plans bridge to carry tracks over county road from Philadelphia Pike to Edgemoor, to include 2 approaches, 1-450-ft. and 1-500-ft. A. C. Shand, Broad St. Station, Phila., Ch. Engr.

Ga., Savannah—City plans bridge over Altamaha River. E. R. Conant, City Engr.

Bridges (Continued)

Fla., Sumterville—See item under "Streets and Roads."

La., Lake Charles—Calcasieu County plans 3 bridges on Lake Shore Drive. About $60,000. Address County Clk., Lake Charles.

Tenn., Knoxville—Southern Ry. will build 2 viaducts, 1 at Gay St. and 1 at State St., providing city will furnish right-of-way and contribute $85,000 towards project. W. H. Wells, Wash., D. C., Ch. Engr. M. W. and Struct.

Tenn., Memphis—City and Illinois Central R.R. plans viaduct on McLemore Ave. J. H. Weatherford, City Engr. A. S. Baldwin, 135 East 11th Pl., Chicago, Ch. Engr. Ry.

Ky., Catlettsburg—See item under "Streets and Roads."

Ky., Marion—Crittenden County election Mar. 22 to vote on $100,000 bonds to build bridges and roads. Address County Clk., Marion.

Ohio, Bucyrus—Crawford County soon receives bids Guy St. bridge. About $15,000. H. A. Keller, Bucyrus, County Engr. N. A. Biedighauser, Bucyrus, County Audr.

Ohio, Delaware—Delaware County Comrs. plan Hartford and Getena bridge over Little Walnut River, on Galena and Westerville Rd., Berkshire Township. W. V. Aldrich, Delaware, County Audr.

Ohio, Warren—Trumbull County receiving bids Mar. 5 bridge on South Main St. Address County Clk., Warren.

Ind., Brownstown—Jackson County receiving bids Mar. 5, 17 bridges. A. Leudtke, Brownstown, County Audr.

Ind., Columbus—City plans additional span to 2nd St. wagon bridge over White River. About $12,000.

Ind., Covington—Fountain County receiving bids Mar. 6 bridge in Cain Township. H. W. Newlin, Covington, County Audr.

Ind., Elkhart—City asked County Comrs. to build concrete bridge over St. Joseph River on Elkhart Ave. L. M. Russell, City Engr.

Ind., Indianapolis—Marion County Comrs. receiving bids Mar. 8 bridge over Lick Creek, Warren Township, retaining walls in Millersville Rd. and repairs to Harding St. bridge. L. K. Fesler, Indianapolis, County Audr. Noted Feb. 8.

Ind., Noblesville—Hamilton County receiving bids Mar. 6, 11 bridges and culverts. W. O. Horton, Noblesville, County Audr.

Ind., Winchester—Randolph County receiving bids Mar. 8 bridges, abutments and repairs in White River Township. Address County Clk., Winchester.

Ill., Arthur—See item under "Canals, Ditches and Irrigation."

Ill., Findlay—Chicago & Eastern Illinois R.R. plans rein.-con. bridge over Okaw River. J. C. Hartley, 66th and Union Ave., Chicago, Ch. Engr.

Ill., Marshall—(Official)—Clark County receiving bids Mar. 14 Turkey Run Bridge, Casey Township, rein.-con. deck girder. Z. Arbuckle, Marshall, County Supt. Highways.

Ill., Savanna—Chicago, Milwaukee & St. Paul R.R. plans bridge over Mississippi River. About $3,000,000. C. F. Loweth, Chicago, Ch. Engr.

Wis., New Holstein—Town made plans 1 span 14-ft. rein.-con. arch bridge.

Ia., Humboldt—Humboldt County receiving bids Mar. 7, 65-ft. steel pony truss bridge, Vernon Township. L. D. Snyder, Dakotah, County Engr. Noted Jan. 4.

Ia., Logan—(Official)—Harrison County receiving bids Mar. 7, 2 concrete bridge piers, 1-60x18 pony truss span, 1-45x16 pony truss span, 2-50x16 pony truss spans, 1-30x20 deck girder, 1-30x24 deck girder and 2 concrete box culverts. A. W. Gaines, Logan, County Engr. Noted Feb. 15.

Ia., Washington—(Official)—Washington County receiving bids Mar. 15, 38 concrete box culverts, 1-30-ft. 1 beam span; 2-30-ft. concrete deck girders; 3-20-ft. concrete slabs; 1-50-ft. pony truss, 1 pair concrete abutments. W. P. Rawn, Court House, Washington, County Engr. Noted Jan. 25.

Minn., Brainerd—Crow Wing County receiving bids about Apr. 1, 3 rein.-con. bridges, 40 corrugated metal culverts and 22 mi. roads. C. L. Moti, Brainerd, County Engr.

Minn., Minneapolis—Hennepin and Dakota Counties receiving bids Mar. 5 bridge over Minnesota River on Lyndale Ave. About $200,000. P. P. Erickson, Minneapolis, County Audr. Hunt & Le Wald, Tribune Annex, Engr. Noted Sept. 7.

Kan. Lawrence—Douglas County Comrs. making plans repairing Eudora bridge. About $10,000. R. McHaripen, Kansas City, Mo., Engr.

Kan., Leavenworth—City made plans concrete bridge on Marion St. H. Perkins, City Engr.

Neb., Fairbury—Jefferson County Comrs. receiving bids Mar. 8 substructure and superstructure and approaches of bridges to be built during year. C. O. Marthis, Fairbury, County Clk.

S. D., Britton—Marshall County receiving bids Apr. 3, culverts during 1917. C. Mohn, Britton, County Audr.

Mo., Jefferson—Cole County rejected bids bridge across Grays Creek. New bids. Address County Clk., Jefferson.

Mo., Kansas City—Bd. Pub. Wks. plan viaduct and retaining wall on Beardsley Rd., from 8th to 12th St., about $200,000. C. Hill, City Engr.

Mo., Kansas City—Bd. Pub. Wks. made plans 4th St. viaduct. C. Hill, City Engr. Waddell & Son, 800 Graphic Art Bldg., Engrs.

Ark., Dardanelle—Yell and Pope Counties plan bridge across Arkansas River. Address Clk. of Yell County, Dardanelle.

Tex., Waco—Attorney General's Dept., Austin, approved $25,000 bond issue for bridges and culverts. G. B. Gunley, City Engr.

Okla., Marble City—See item under "Streets and Roads."

Okla., Timinge—See item under "Streets and Roads."

Idaho, Kellogg—City plans bridge to connect with Sunnyside Dist.

Ariz., Clifton—Town receiving bids about Mar. 15, 2 bridges over San Francisco River. A. J. Kerr, Town Engineer.

Wash., Duvall—King County making plans bridge. About $25,000. S. J. Humes, Seattle, County Engr.

Wash., Sprague—See item under "Streets and Roads."

Bids In and Contracts Awarded

N. J., Salem—Bd. Chosen Freeholders, Salem County rejected bids Penn's Neck Bridge over Salem River. Address County Clk., Salem.

Pa., Knoxville—Supt. Pub. Grounds and Buildings, Capitol Bldg., Harrisburg, let contract bridge over Cowanesque River to STEBBINS CONSTRUCTION CO., Wellsboro. About $16,000. Noted Feb. 8.

Pa., Phila.—Philadelphia & Reading Ry. let contract bridge over Hill Creek to BROWN-KING CONSTRUCTION CO., Commercial Trust Bldg. About $8000.

Md., Georgetown—State Bd. Comm. let contract bridge over Sassafras River to STROBEL STEEL CONSTRUCTION CO., 53 West Jackson St., Chicago. About $14,765. Noted Jan. 18.

Md., Indian Head—See item under "Railways."

Md., Ocean City—State Highway Comm. let contract bridge over Sinepuxent Bay to STROBEL STEEL CONSTRUCTION CO., 53 West Jackson St., Chicago. About $15,065. Noted Oct. 19.

Mich., Ann Arbor—(Official)—City received low bids bridge over Huron River on Broadway (a) with roadway paving (b) without roadway paving, from J. P. Rusche, Grand Rapids (a) $51,661, (b) $50,376; A. B. Prange, Grand Rapids, (a) $53,623, (b) $52,093; B. Douglas Co., Ann Arbor, (a) $60,734, (b) $59,204. Noted Jan. 25.

Ill., Kankakee—(Official)—Kankakee and Will County let contract Warner bridge to M. & P. CONTRACTING CO., Hatfield, Ind. About $47,569.

Ill., Paris—Edgar and Clark Counties let contract Handly County line bridge to VINCENNES BRIDGE CO. About $5600. Noted Feb. 8.

Ill., Watseka—(Official)—Iroquois County let contract rein.-con. girder bridge, Milford Township to CHICAGO GENERAL CONSTRUCTION CO., 833-4 Manhattan Bldg., Chicago. About $6008. Noted Feb. 8.

Ia., Maquoketa—Jackson County let contract bridges to ANDERSON & SON, Maquoketa; R. A. BULLOCK, Onslow, and J. J. BOWMAN, Beleme.

Ia., Northwood—Worth County let contract 5-1 beam bridges to R. M. WEBLEMOE. About $7700.

Ia., Rockwell City—Calhoun County let contract 2-100-ft. spans and 1-100-ft. span bridges to MONARCH ENGINEERING CO., Falls City, Neb., $14,919 and $6700 respectively; 1-90-ft. 1-70-ft. and 1-45-ft. spans to IOWA BRIDGE CO., Des Moines, $6491, $4418 and $2863 respectively. Noted Feb. 8.

Kan., La Crosse—Rush County let contract 20 concrete bridges to EDWARDS & TURNER, La Crosse. Noted Feb. 8.

Neb., Butte—Boyd County let contract bridges to NORFOLK BUILDING AND CONTRACTING CO., Norfolk.

Neb., Schuyler—Colfax County let contract bridges to ELKHORN CONSTRUCTION CO., Fremont. Noted Jan. 25.

S. Dak., Madison—State Highway Commission let contract steel and concrete bridge near Junius to M. BIJLSMA, Winfred.

Wyo., Lusk—Niobrara County let contract steel bridge over Running Water Creek to MONARCH ENGINEERING CO., Falls City, Neb. Noted Jan. 25.

Wyo., Sheridan—Sheridan County let contract 4-steel truss bridges to MONARCH ENGINEERING CO., Denver. About $19,188. Noted Feb. 8.

Mo., Monroe City—See item under "Railways."

Calif., Modesto—Stanislaus County let contract 12 bridges to BORDWELL & ZIMMERMAN, Calistoga.

N. B., Fredericton—City let contract 4 span stone and concrete bridge to NEW BRUNSWICK-POWERS & BREWER, 107 Prince William St., St. John.

WATER-WORKS

Proposed Work

R. I., Providence—City receiving bids Mar. 12, 8,000,0000-gal. pumping unit at Hope Pumping Station. J. H. Gainer, Mayor.

N. Y., Ft. Ann—(Official)—Bd. Trustees receiving bids Mar. 15, water-works. W. M. Main, Village Pres. C. E. Perry, 36 State St., Albany, Consult. Engr. (See adv.)

N. Y., Geneva—Bd. Pub. Wks. receiving bids Mar. 20 filter unit. H. K. Seybolt, Supt.

N. J., Leesburg—See item under "Sewers."

N. J., Ogdensburg—Boro. receiving bids Mar. 15 water-works system and clearing and grubbing 100 acres land for reservoir purposes. J. B. Rider, 29 Broadway, New York, Engr.

Pa., Evans City—City receiving bids about Apr. 1 concrete reservoir, 20,000 bbl. capacity, and new filter beds.

Ga., Albany—City plans concrete reservoir, 1,000,000-gal. About $15,000. W. F. Tift, Supt.

Ga., Statesboro—See item under "Streets and Roads."

Fla., New Smyrna—City plans election to vote on $10,000 bonds to install water-works.

Miss., Biloxi—City will purchase pump for pumping station.

La., Bossier—City plans election Apr. 20, to vote on $30,000 bonds to install water-works.

Tenn., Kingsport—City plans water-works, electric-light plant and street paving.

Ohio, Akron—Bd. Pub. Ser. receiving bids Mar. 5, 2 water tube boilers, 300 hp. ea., to be installed in Cuyahoga River Pumping Station near Kent. G. G. Difan, Engr.

Okla., Coyle—City election Mar. 5 to vote on $13,000 bonds for water system.

Ohio, Dayton—City making surveys extending water-works. Metcalf & Eddy, Boston, Engr.

Ohio, Jefferson City—Village voted $20,000 bond issue to build water system. F. G. Brown, Village Clk. Noted Jun. 15.

Ohio, Mechanicsburg—City plans water-works. Richard Engineering Co., Columbus, Engr.

Mich., Pontiac—City voted $275,000 bonds to extend and improve water system. H. L. Weaver, Supt. Noted Feb. 22.

Ill., Farmington—H. W. Clark Co., Mattoon, making plans sinking deep well for city.

Wis., Hartford—City receiving bids Mar. 6, drilling wells. W. G. Kirchoffer, Madison, City Clk.

Wis., Portage—City making plans filter plant. About $50,000. G. E. James, Supt. L. P. Wolff, 1000 Germania Bldg., St. Paul, Arch.

Ia., West Burlington—City receiving bids Mar. 5, improvements to water system and sanitary storm sewer. About $70,000. W. J. Giesciman, City Clk.

Minn., Akeley—City receiving bids Mar. 7, 50,000-gal. steel tank and tower. E. A. Graham, Act. Recdr.

Minn., Minneapolis—City retained W. N. Jones, 1010 Bayless Ave., St. Paul, to make plans filter plant. About $1,200,000. A. J. Jensen, Supt.

Minn., West Concord—City making plans water mains, steel tank, 50,000 gal. capacity on 100-ft. steel tower. W. C. Buck, 4821 Fremont Ave. S, Minneapolis, Engr.

Kan., Beloit—City making plans purification plant. About $25,000. Black & Veatch, Interstate Bldg., Kansas City, Mo., Engr.

Kan., Caney—City made plans improving water system. Black & Veatch, Interstate Bldg., Kansas City, Mo., Engr.

Kan., El Dorado—City voted $60,000 bonds extending and improving water system. Noted Jan. 18.

Kan., Lawrence—City soon receives bids improving water system. About $200,000. F. D. Brooks, City Clk. Black & Veatch, Interstate Bldg., Kansas City, Mo., Engr.

Wyo., Laramie—G. U. Rhoemaker, Mayor, recommends enlarging water system. S. E. Nevison, Supt.

Mont., Great Falls—Supreme Court granted city permission to build filter plant. About $187,000. F. Piper, Comr.

Mont., Scobey—(Official)—City postponed improving water, sewer and electric-light systems indefinitely. Noted Jan. 25.

Tex., Houston—State Attorney Gen. Dept., Austin, approved $75,000 bonds for water system and $25,000 to pave streets.

Okla., Billings—City making plans water-works, sewers and electric-light plants. Mackintosh-Walton Engineering Co., 1023 State National Bank Bldg., Oklahoma, Engr.

Okla., Enid—City plans election in May to vote on $50,000 bonds to install water-works. F. W. Brooks, Supt.

Okla., Frederick—City election Mar. 20 to vote on $75,000 bonds to purchase and improve water and light plant. Noted Nov. 30.

Water-Works (Continued)

Okla., Kaw—(Official)—City receiving bids Mar. 9, water system. About $25,000. Benham Engineering Co., Colcord Bldg., Oklahoma, Engr. Noted Feb. 8.

Colo., Englewood—Council plans election in April to vote on $200,000 bonds for water system. Noted July 13.

Colo., Florence—City plans election to vote on bonds improving reservoir and water system. D. H. Houston, Supt.

Utah, Duchesne—City voted $7000 bonds to build water system.

Calif., Sacramento—City plans underground water system.

Que., Nominingue—Council soon receives bids aqueduct. About $22,000. Roy & Toupin, 72 Notre Dame East, Montreal, Arch.

Bids In and Contracts Awarded

N. Y., Gloversville—(Official)—City to build storage reservoir by day labor. Noted Feb. 15.

Pa., Allentown—(Official)—City let contract boilers for pumping station to HEINE SAFETY BOILER CO., St. Louis, Mo. Noted Jan. 25.

Pa., Middletown—City let contract water system to E. EiD CO., About $19,387.

W. Va., Kanawha City—Libby-Owens Sheet Glass Co., subsidiary of Toledo Bottle Co., let contract reservoir to C. W. McNULTY, 714½ Quarrier St., Charleston.

Ill., Little York—Village let contract water system to M. McOLLIGOT, Evanston. Noted May 4.

Ill., Springfield—City rejected bids pipe for water mains.

Minn., St. Paul—City let contract high service reservoir on Dale St. to G. J. GRANT CONSTRUCTION CO., $246,054.

Mont., Great Falls—City let contract purifying plant to GRANT SMITH & CO., Henry Bldg., Seattle. About $25,000.

Tex., Port Arthur—City let contract pumping plant to SPENCE-HOWE CONSTRUCTION CO. About $18,800. Noted Nov. 23.

SEWERS

Proposed Work

R. I., Woonsocket—Bd. Sewer Comrs. plans South Main St. trunk sewer. About $12,000. M. H. Bronsdon, City Engr.

Ct., Bridgeport—See item under "Streets and Roads."

N. Y., New York—(Brooklyn)—L. H. Pounds, Boro. Pres., Boro. Hall, receiving bids Mar. 8, repairing sewer portion 49th St.

N. J., Fanwood—City making plans sanitary sewer system to connect with Plainfield system. Fuller & McClintock, Engr.

N. J., Kearney—(Arlington Post Office)—Bd. Health plans extension of sewer system to Kearney Meadow section near Lincoln Highway for Ford and White Tar Co.'s new plant. H. P. Kreimer, City Engr.

N. J., Leesburg—J. P. McCormick, Supt. State Prison, Trenton, receiving bids in March sewer and water systems in State Prison Farm. About $10,000. G. S. Drew, State House, Trenton, Arch.

N. J., Perth Amboy—See item under "Miscellaneous."

N. J., Plainfield—City will issue $33,500 bonds to install storm sewers and extend system. R. J. Gavett, City Engr.

Pa., Athens—City making plans sewer system. About $35,000. R. R. Fernow, 817 Weightman Bldg., Phila., Engr.

Pa., Coatesville—(Official)—City receiving bids Mar. 19, 4444 ft. 8-in. terra-cotta pipe for sanitary sewer. J. W. Harry, City Emgr. Noted Feb. 22.

Pa., Johnstown—(Official)—Supt. Streets and Public Improvements receiving bids Mar. 20, sanitary sewers and appurtenances in Sect. No. 2. (See adv.)

Pa., Kane—City plans sewage-disposal plant and additional sewers. R. S. Braden, City Engr.

Pa., Landsdale—City plans sewage system. About $200,000.

Pa., Norristown—Boro. plans storm and sanitary sewers. A. C. Corson, Engr.

Pa., Pottsville—City making plans sewage disposal plant. About $350,000. W. S. Pugh, City Engr.

Pa., Scranton—(Official)—City retained A. Potter Consult. Engr., 50 Church St., New York, to make plans comprehensive sewer system and disposal plant. W. A. Schunk, City Engr.

Pa., Sharpsville—Boro. plans joint sewage-disposal plant for Sharon, Farrell and Sharpsville.

Md., Hagerstown—City making plans sewer system. About $200,000. J. Carmichael, Chn. Sewage Comrs.

Md., Ocean City—City plans sewer system. About $30,000.

Md., Towson—City plans sewage-disposal plant.

W. Va., Hinton—City plans extending sewer system. J. B. Lavender, City Engr.

Ga., Cairo—City will vote Mar. 20 on $28,000 bonds to install sewers. Contract will soon be let. R. W. Miller, Mayor. Noted Dec. 7.

Fla., Miami—City will vote Mar. 20 on $150,000 bonds to install sewer system and disposal plant.

Fla., St. Petersburg—City voted $30,000 bonds to install sewage-disposal plant. Noted Jan. 11.

La., Monroe—City will vote Mar. 20 on $100,000 bonds to install sanitary sewers.

Ky., Owensboro—City will improve sewer system. E. B. Shifley, City Engr.

Ohio, Cuyahoga Falls—(Official)—Village receiving bids Mar. 12, 5 mi. main and lateral sanitary sewers. R. W. Pratt, 708 Hippodrome Bldg., Cleveland, Consult. Engr. W. F. Willis-ton, Village Clk. (See adv.)

Ind., Indianapolis—City plans sewer main in portion Illinois St.

Ind., Shelbyville—City receiving bids Mar. 6 storm sewer in Tompkins St. About $10,000. G. McBride, City Engr.

Ill., Springfield—City made plans extending Town Branch Sewer. About $175,000. W. Seeley, City Engr.

Wis., Sturgeon Bay—Common Council making plans sewer extensions.

Ia., Newton—City making plans sewage-disposal plant. M. G. Hall, Centerville, Engr.

Ia., West Burlington—See item under "Water Works."

Minn., Crystal Lake—City making plans sanitary sewer system and purification plant. About $74,000. H. M. Price, 8 South Dearborn St., Chicago, Engr.

Minn., St. Paul—City plans to build St. Anthony Hill relief sewer. About $797,000. O. Clausen, City Engr.

Minn., St. Paul—City plans sewers in Palace, Bellowes, Hyacinth, Charlton, Winona, Fillmore and Laurel Ave. O. Claussen, City Engr.

Neb., Havelock—City voted $5000 bonds to extend sewers. A. J. Blount, City Clk.

Neb., Wakefield—City plans sewer system.

S. D., Clear Lake—City receiving bids Apr. 1, 4½ mi. sewers and sewage-treatment plant. Dakota Engineering Co., Mitchell, S. D., Engr. Noted Feb. 1.

S. D., Sioux Falls—Minnehaha County receiving bids Mar. 20, 15 blocks lateral sewers. Address County Clk., Sioux Falls.

S. D., Watertown—(Official)—City Council will not install lateral storm sewers. Noted Feb. 8.

Mont., Scobey—See item under "Water-Works."

Mo., Mexico—(Official)—City election in April to vote on bonds to install septic tank. W. Dearing, City Clk. Noted Feb. 15.

Ark., Marvell—City making plans sewer system. About $32,000. U. S. Sanitary Septic Tank Co., 1212 Cotton Exchange Bldg., Memphis, Tenn., Engr.

Tex., Lockport—City sold $35,000 bonds to improve and extend sewer system.

Tex., Waxahachie—Attorney General's Dept., Austin, approved $20,000 bonds extending sewers.

Okla., Billings—See item under "Water-Works."

Okla., Billings—See item under "Light Heat and Power."

Idaho, Nezperce—(Official)—City receiving bids Mar. 7, sewer system. About $35,000. Sawyer Bros., Spokane, Engr. Noted Feb. 8.

Idaho, Rupert—City voted bonds to install sewers.

Ore., Pendleton—City soon lets contract septic tanks. About $10,000.

Calif., Ventura—City making plans sewerage system, storm water sewer and culverts. About $40,640. May vote on bond issue.

Que., Montreal—City plans sewer in St. Patrick St. About $35,000.

Alta., Edmonton—City plans sewage disposal plant. About $600,000.

Bids In and Contracts Awarded

N. Y., New York—(Brooklyn)—(Official)—L. H. Pounds, Boro. Pres., Room No. 2, Boro. Hall, received low bids sewage pumping station at Morgan Ave. and Maspeth Ave., Sect. No. 3, of torm and sanitary sewers in portion of Maspeth Ave., combined sewers in portion Conselyea Ave., storm sewer in portion Gardner St., from Watson Flagg Engineering Co., 27 Thames St., $52,900. C. R. Simpson, 170 Broadway, $52,934, Lupfer & Remick, Broadway and 25th St., $54,494; all of Manhattan. Noted Feb 8.

N. Y., Oswego—(Official)—Dept. Works received low bids sewers in various streets from R. Compo. $9733; M. Barber, Binghamton, $10,497; N. Batti, $11,084.

Ohio, Columbus—City let contract 3rd Ave. sewer to AMES BROS., $30,000; Hunter Ave. sewer, D. E. SULLIVAN & SONS, Terminal Bldg., $34,000.

Ohio, Dayton—City let contract storm sewer and repaving Jefferson St. to KERSHNER & SMITH, 1401 North Main St., $22,000.

Ohio, Dayton—City let contract sanitary sewers in various streets to W. S. DILL.

Ind., Gary—City let contract sewer on South Side to HEINY & HOLBEN, $288,577.

Ind., Michigan City—Bd. Pub. Wks. let contract sewers to P. MICHAELY.

Mich., Romeo—City let contract storm sewer in Main St. to M. MAXWELL.

Wis., Waukesha—Council let contract improving septic tank and installing grit chamber to C. R. PHILLIPS, Waupacca. About $8516. Noted Feb. 1.

Ia., Iowa Falls—City let contract sewers on west side to W. E. WELDON, $4306.

Ia., Stratford—City let contract sewer system and disposal plant to H. J. CANTHROE, Omaha, Neb., $26,923.

Minn., Ironton—City let contract sewage plant to PASTORET CONSTRUCTION CO., Duluth, $6195.

Minn., Minneapolis—(Official)—City will install sewers in Linden Hills Dist. by day labor. F. W. Cappelin, City Engr. Noted Feb. 15.

Kan., Humboldt—City let contract in Dist. No. 2 to EVERETT & BURT, Hutchinson, $35,021. Noted Jan. 25.

Kan., Iola—City let contract sewers to FRY CONSTRUCTION CO., $7717.

Okla., New Wilson—(Official)—City let contract sewers to McINTOSH & WALTON, Oklahoma, $29,700. Noted Feb. 28.

Calif., Los Angeles—City received low bid sewer in portion Fountain St. from L. Volenterio, $42,500. Noted Feb. 22.

N. S., Halifax—City let contract intercepting sewers to COOK CONSTRUCTION CO., $70,000.

GARBAGE

Proposed Work

N. Y., New York—(Manhattan)—J. T. Fetherston, Comr., Street Cleaning, Room 1244, Municipal Bldg., receiving bids Mar. 8 furnishing and delivering, Class 1, ash and garbage compartments, Class 2, combination rubbish tops and covers for compartments on trailers.

N. J., West New York—Town North Hudson Sect. Hudson County plan joint garbage incinerator. Address J. B. Frudenberger, West New York.

STREETS AND ROADS

Proposed Work

Mass., Boston—City estimates cost of highway improvements as follows: Chelsea St., $150,000; Faneuil and Morton St., $125,000 each; North Beacon St., $100,000. E. Murphy, Comr. Pub. Wks.

Ct., Bridgeport—Special—City Advisory Comr. recommends $6,400,000 bond issue improvements as follows: $1,250,000 street extensions, $1,000,000 paving, $2,000,000 sewers, $1,000,000 for schools, $200,000 isolation hospital, $125,000 clinic, $100,000 police and fire department building, $750,000 park extensions. A. H. Terry, City Engr.

N. Y., Fairport—Village receiving bids Mar. 5 paving streets, bituminous concrete. About $20,000. C. F. Fisher, 304 Ravine Ave., Rochester, Consult. Engr. Noted Feb. 8.

N. Y., Irvington—Village receiving bids Mar. 6, paving Broadway. J. A. Murphy, Clk.

N. J., Elizabeth—T. E. Collins, City Engr., estimates cost grading both sides Baltic Bridge at $25,000.

N. J., Farmingdale—Bd. Freeholders Monmouth County plans improving and widening 3 mi. Farmingdale-Colts Neck Rd. Address County Clk., Freeholders.

N. J., Newark—City receiving bids Mar. 20 paving portions Edwin Pl., Mapes Pl., Norwood St., Stengel, Columbia, Mt. Pleasant Ave., and Telford St., concrete. M. R. Sherrard, City Engr.

N. J., Newton—(Official)—Bd. Chosen Freeholders, Sussex County receiving bids Mar. 5, 61,000 yd. concrete paving, Deckerton-Newton Turnpike. Address County Clk., Newton.

N. J., Perth Amboy—See item under "Miscellaneous."

N. J., Plainfield—City plans paving 12 streets, brick. A. J. Gavett, City Engr.

Pa., New Eagle—(Official)—Borough receiving bids Mar. 9, 12,150 sq.yd. brick paving on Main, Pine and Hemlock St. About $30,000. A. L. McVicker, Monongahela, Engr. Noted Dec. 21.

Pa., Sunbury—G. W. Keefer, City Engr., estimates cost of brick paving on portions of Penn and Miller St. and Lenker Ave. at $27,600.

Pa., Thornburg—Boro plans improving Thornburg Rd.

Del., Wilmington—New Castle County and State Highway Comn. lets contract in spring 2 mi. macadam road in Christiania Township from Centerville to Ashland Rd., Also limestone road in Mill Creek Township from Newark Rd. Toward Hockessin. Address County Clk., Wilmington.

Streets and Roads (Continued)

Md., Baltimore—State Roads Comn., 601 Garrett Bldg., receiving bids Mar. 6. Contract No. Ce-9, Cecil County, road leading from Porter's Bridge to Rising Sun, 3.40 mi. concrete or oil bound macadam; Contract No. Ce-18, Cecil County, section road through Elkton, 1.11 mi. concrete; Contract No. Ho-2, Howard County, section of road leading from Snells Bridge to Clarksville, 3.7 mi., concrete or oil bound macadam. Frank H. Zouck, Chn. (See adv.)

Va., Newport News—City voted $50,000 bonds for improving streets. T. E. Pearse, City Engr. Noted Oct. 15.

Va., Norfolk—City plans paving portion Berkley Ave. W. H. Taylor, City Engr.

W. Va., Ceredo—City voted $33,000 bonds paving portion High, Main and B St. Noted Feb. 1.

W. Va., Elkins—Randolph County to vote Mar. 10 in Dry Fork Magisterial Dist. on $130,000 bonds to build permanent roads. Address County Clk., Elkins.

W. Va., Fairmount—Marion County, Grant Dist., election Mar. 27 to vote on $195,000 bonds to build roads. Address County Clk., Fairmount.

W. Va., Fayetteville—Fayette County receiving bids Apr. 2, improving of James River and Kanawha Turnpike, Sewall Mountain Dist. T. F. Maloy, Dist. Road Engr. R. J. Stegall, Fayetteville, County Clk. (See adv.)

W. Va., Morgantown—Monongalia County receiving bids Mar. 15 paving 6 mi. highway Morgan Dist., brick, concrete and macadam. About $110,000. W. S. Downs, Morgantown, County Engr.

W. Va., Welch—McDowell County voted $1,385,000 bonds to improve roads in Adkins, Brown Creek, Elkhorn and Northfork Magisterial Dist. Address County Clk., Welch.

W. Va., Winfield—Putnam County, Curry Dist., plans $150,000 bond issue to build roads. Address County Clk., Winfield.

N. C., Canton—City receiving bids Mar. 12 20,000 sq.yd. paving, concrete, brick or bitumen. J. T. Horney, City Clk.

N. C., Elizabeth City—Bd. Aldermen voted $20,000 bonds to pave portions of Broad, Cypress, West Burgess, Pearl and other streets.

N. C., Fayetteville—City plans paving Bradford and Arsenal Ave.

N. C., Hamlet—Town sold $50,000 bonds for paving streets.

N. C., Lenoir—City lets contract in March paving various streets, sheet asphalt and concrete; also building concrete curbs. About $150,000. E. W. Cole, City Engr.

N. C., Lillington—Harnett County, Neils Creek Township, plans several miles road. About $15,000 available. Address County Clk., Lillington.

N. C., Rocky Mount—City receiving bids Mar. 16, paving Falls Rd., about 16,000 sq.yd. asphalt with concrete base or bitulithic, 7000 lin.ft. concrete curb and gutter. G. C. White, City Engr.

N. C., Thomasville—City plans to vote on $8000 bonds to pave streets.

S. C., Barnwell—City plans paving Main St.

S. C., Camden—G. N. Mitcham, City Engr. estimates cost of paving portions of Main, East and West De Kalb St., at from $85,000 to $95,000.

S. C., Chester—Chester County plans $450,000 bond issue to build roads. Address County Clk., Chester.

S. C., Darlington—City voted $50,000 bonds to pave streets. Noted Jan. 25.

S. C., Laurens—(Official)—Laurens County to vote in May on $300,000 bond issue to improve roads. C. A. Power, Laurens, County Clk. Noted Feb. 8.

S. C., St. Matthews—City plans paving streets business dist.

Ga., Barnesville—City voted $15,000 bonds to pave streets and sidewalks. Noted Jan. 18.

Ga., Decatur—City plans paving 25 mi. streets.

Ga., Griffin—City plans bond issue for paving streets.

Ga., Savannah—Chatham County plans graded road, 30-ft. wide, south of Montgomery Rd. and Little Ogeechee Neck Rd. Address County Clk., Savannah.

Ga., Statesboro—City voted $60,000 bonds to pave streets and improve water and light plant. Noted Dec. 14.

Fla., Orlando—City plans election to vote on $60,000 bonds for brick paving.

Fla., Quincy—City retained J. B. McCrary Co., Atlanta, Ga., to make plans improving streets. Election will be held soon to vote on bond issue for work.

Fla., Sumterville—Sumter County receiving bids Mar. 5, 645,000 lin.ft. of roadway, asphalt macadam penetration method, with necessary culverts and bridges. Address County Clk., Sumterville.

Ala., Butler—Choctaw County Comrs. soon let contract 200 mi. roads. Address County Clk., Butler.

Ala., Carrollton—Pickens County will spend $130,000 to build good roads. Address County Clk., Carrollton.

Miss., Aberdeen—Monroe County voted $40,000 bonds improving roads. G. G. Ray, Aberdeen, Clk. Bd. Supervs. Noted Nov. 16.

Miss., Ackerman—Choctaw County plans road between Ackerman and Weir Fentress. Address County Clk., Ackerman.

Miss., Decatur—Newton County, Beat 1, plans improving 50 mi. roads, sand clay. About $30,000 available. Address County Clk., Decatur.

Miss., Greenville—Washington County Bd. Supervs. received plans from Highway Comn. for building 2 permanent highways. Address County Clk., Greenville.

Miss., Hattiesburg—Forrest County plans paving 50-mi. gravel road. Address County Clk., Hattiesburg.

Miss., Iuka—Tishomingo County receiving bids Mar. 8 about 6 mi. gravel roads. Address County Clk., Iuka. Noted Oct. 26.

Miss., Magnolia—Pike County sold $50,000 bonds to build roads. Address County Clk., Magnolia.

Miss., New Albany—Union County receiving bids Mar. 15, 20 mi. intercounty roads. About $300,000. Address County Clk., New Albany. Noted Jan. 25.

Miss., Starkville—City plans paving streets.

Miss., Waynesboro—Wayne County sold $25,000 bonds to build roads. Address County Clk., Waynesboro. Noted Nov. 16.

La., Jennings—City soon receives bids paving streets.

Tenn., Hohenwald—Lewis County sold $100,000 bonds to build roads. Address County Clk., Hohenwald. Noted Jan. 4.

Tenn., Jonesboro—Washington County will vote Mar. 17 on $750,000 bonds to build highways and on Apr. 7 on $500,000 additional bonds. Address County Clk., Jonesboro. Noted Feb. 22.

Tenn., Kingsport—See item under "Water-Works."

Ky., Bowling Green—Warren County voted $15,000 bonds and will ask State-Aid Dept. to appropriate $15,000 to build roads. Address County Clk., Bowling Green.

Ky., Catlettsburg—Boyd County sold $175,000 bonds to build roads and bridges. Address County Clk., Catlettsburg.

Ky., Marion—See item under "Bridges."

Ky., Morganfield—Union County receiving bids Mar. 7 repairing inter-county seat roadways. About $20,000. Address County Clk., Morganfield.

Ky., Shelbyville—City plans to spend $10,000 to improve streets.

Ohio, Canton—City plans improving portion Rosewood Pl. W. E. Sarver, City Engr.

Ohio, Cincinnati—City receiving bids Mar. 5 improving portions Vine and Rice St. F. Krug, City Engr.

Ohio, Cleveland—Cuyahoga County to sell $36,847 bonds for improving Brook Park Rd. W. A. Stinchcomb, Cleveland, County Engr.

Ohio, Cleveland—Cuyahoga County plans improving Fitzwater and Royalton Rd. About $190,000. Address County Clk., Cleveland.

Ohio, Cleveland—Cuyahoga County receiving bids about Apr. 1 improving 3 mi. Spencer-Maatick Rd., brick or asphalt. W. A. Stinchcomb, Cleveland, County Engr.

Ohio, Cleveland—Cuyahoga County receiving bids about Apr. 1 improving 9 mi. Brentleyville Rd., brick or asphalt. W. A. Stinchcomb, Cleveland, County Engr.

Ohio, Columbus—Putnam County made plans paving Putnam Township. About $50,000. P. E. Ford, Ottawa, County Engr. J. E. Roose, Ottawa, County Audr.

Ohio, Dayton—City plans paving portion 3rd St. F. O. Eichelberger, City Engr.

Ohio, Dayton—See item under "Sewers."

Ohio, Hamilton—Butler County sold $118,000 bonds improving Hamilton, Scioto, Springdale, Hamilton, Middletown and Franklin Rds. Address County Clk., Hamilton.

Ohio, Lima—(Official)—City receiving bids Mar. 8, paving, curbing, guttering and sewers in McPheran, Madison and Seland Ave., West Vine, Scott, Metcalf and Jackson St. About $132,000. V. C. Miller, City Engr. Noted Feb. 8.

Ohio, McConnellsville—Council passed resolution paving Kennebeck Hill and Center Rd.

Ohio, Marion—Council passed ordinance to improve Mary St. E. S. Oult, City Engr.

Ohio, Marion—(Official)—City receiving bids Mar. 16, 20,000 sq.yd. paving. E. S. Ault, City Engr.

Ohio, Milford—Village receiving bids Mar. 6 improving portions Center St., bituminous macadam. R. L. Schroeder, Village Clk.

Ohio, Piqua—City making plans paving West Ash, South Main, West Green, West North and College Ave. A. Shroeder, City Engr.

Ohio, Ravenna—Portage County voted $20,000 bonds for improving road south from Atwater Center to Stark County line. Address County Clk., Ravenna.

Ohio, Sidney—City making plans paving several streets. T. Blake, City Engr.

Ohio, Tiffin—City plans paving Maple St., and repaving Washington St. L. O. Runkle, City Engr.

Ohio, Urbana—City making plans paving portions West Water St. E. F. Sweetman, City Engr.

Ohio, Willshire—Village making plans paving State St. About $22,000. L. A. Boulay Co., Toledo, Engr.

Ind., Bloomfield—Greene County, Beech Creek Township plan James Hudson et al. macadamized road. State to appropriate one half cost. Address County Clk., Bloomfield.

Ind., Bloomington—Monroe County receiving bids Mar. 6 roads in Bean, Blossum and Richland Township. H. Blakely, Bloomington, County Audr.

Ind., Brazil—Clay County Comrs. receiving bids Mar. 5 improving road Jackson Township. W. O. Graeser, Brazil, County Audr.

Ind., Cannelton—Perry County receiving bids Jan. 1, macadam road Tobin Township. M. C. Conway, Cannelton, Audr.

Ind., Columbus—Bartholomew County making plans 3 mi. crushed stone road Rock Creek Township. About $15,000. L. Roberts, Columbus, County Engr. W. H. Scott, Columbus, County Audr.

Ind., Covington—Fountain County receiving bids Mar. 6 gravel and stone roads. H. W. Newlin, Covington, County Audr.

Ind., Jeffersonville—Clark County receiving bids Mar. 5 improving Fulton Landing Hill, Owen Township. G. W. Stoner, Jeffersonville, County Audr.

Ind., Lawrenceburg—Dearborn County receiving bids Mar. 22 road on Dearborn and Ripley county line. H. E. Lutherbeck, Lawrenceburg, County Audr.

Ind., Martinsville—Morgan County receiving bids Mar. 6 gravel road Green Township. S. Watson, Martinsville, County Audr.

Ind., Monticello—White County receiving bids Mar. 6 improving highway. A. G. Fisher, Monticello, Audr.

Ind., Mt. Vernon—Posey County receiving bids Mar. 6, 12,030 and 9352-ft. gravel road, Black Township. Address County Clk., Mt. Vernon.

Ill., Arcola—City making plans paving ¾ mi. road, monolithic brick. C. L. James, Mattoon, Engr.

Ill., Benton—(Official)—Franklin County receiving bids about Apr. 1, paving roads in Denning and West Frankfort Townships, concrete. About $70,000. Putman & Mautz, Engr. Noted Feb. 15.

Ill., Carmi—White County election in March to vote on $250,000 bonds to build roads. Address County Clk., Carmi.

Ill., East Dubuque—J. Eliwanger, Secy., Dubuque Bridge Co., postponed receiving bids paving east approach to Dubuque bridge from Feb. 13 to Mar. 13. M. Tachirgi & Son, 712 American Trust Bldg., Cedar Rapids, Ia., Engr. Noted Jan. 25.

Ill., Galesburg—Bd. Local Impvts. plans paving South St., $9843.

Ill., Harrisburg—Saline County Comrs. plan road between Harrisburg and Raleigh Townships. Address County Clk., Harrisburg.

Ill., Hillsboro—Council passed ordinance paving Hamilton and Wood St.

Ill., Rochelle—Ogle County plans $500,000 bond issue to build roads. Address County Clk., Rochelle.

Ill., Witt—Council passed ordinance to pave Broadway.

Wis., Alma—Buffalo County will vote Apr. 13 on $350,000 bond issue to build roads. J. Meill, Alma, County Audr.

Wis., Appleton—City made plans paving. About $35,000. A. C. Renley, City Engr. E. L. Williams, City Clk.

Wis., Oshkosh—City plans paving 2 mi. streets. G. H. Randall, City Engr. D. Witzel, City Clk.

Wis., Portage—City receiving bids Mar. 6 paving 22,470 lin.ft., concrete curb and gutter, relaying 9700 sq.yd. old vitrified brick pavement and paving 32,600 sq.yd. new pavement, vitrified brick, concrete, bituminous concrete or bitulithic; also 9200 sq.yd. sheet asphalt pavement on present old brick pavement on Cook, Wisconsin and De Witt St. F. F. Goss, City Clk.

Wis., Racine—Bd. Pub. Wks. receiving bids Mar. 17, grading and paving Carlisle Ave., 4598 sq.yd. sheet asphalt, 2011 lin.ft. combined curb and gutter, 1695 lin.ft. concrete curbing; grading and paving Washington Ave., 12,071 sq.yd. brick, 4118 lin.ft. combined curb and gutter, 3104 cu.yd. excavation not including subgrade; Wilson St., 1559 sq.yd. rein.-con. pavement, including integrale curb; Jones St., 1440 sq.yd. paving, 960 lin.ft. combined curb and gutter; Michigan Blvd., 16,696 sq.yd. brick paving, 8570 lin. ft. combined curb and gutter. P. H. Connolly, City Engr.

Wis., Tomah—City rejected bids paving portions of Kilbourn Ave. New bids about Apr. 1. Noted Dec. 21.

Ia., Cedar Falls—City plans paving Main St., 3 mi. C. H. Streeter, City Engr.

Streets and Roads (Continued)

Ia., Keokuk—City plans paving South 8th St., brick, also several miles sidewalks. J. F. Winters, City Engr.

Ia., Sioux City—Woodbury County receiving bids about Mar. 20 grading 125,000 cu.yd. J. C. McLean, Sioux City, County Engr. E. E. Hosmer, Sioux City, County Audr.

Minn., Brainerd—See item under "Bridges."

Minn., Ivanhoe—Lincoln County receiving bids Mar. 6 State Rd. K. A. Hansen, Ivanhoe, County Audr.

Minn., Minneapolis—City plans paving portion 1st St., creosote blocks. F. W. Cappelen, City Engr.

Minn., Willmar—C. J. Estlund, Highway Engr. estimates cost of grading and graveling roads Kandiyoki County at $33,000. Address County Clk., Wilimar.

Kan., Columbus—City receiving bids Mar. 5 paving 11,700 yd. F. H. Hawkins, City Clk. G. Rader, City Engr.

Neb., Norfolk—City election Mar. 10 to vote on $30,000 bonds street improvements. H. H. Tracy, City Engr.

S. D., Mitchell—City receiving bids about Mar. 5, 18,000 sq.yd. concrete, asphaltic concrete, or wood block pavement on concrete foundation, 8000-ft. concrete curb. S. H. Smith, P. O. Box, 122, City Engr.

N. D., Wahpeton—City receiving bids Mar. 5 paving Dist. No. 1, asphalt, brick, creosoted wood block or bitulithic. S. H. Murray, City Audr. Noted Jan. 11.

Mo., Jefferson—Cole County plans widening Ten Mile Drive. Address County Clk., Jefferson.

Mo., Jefferson—Cole County surveying Boonville Rd. from Grays Creek to county line for 40-ft. roadway. Address County Clk., Jefferson.

Mo., Ozark—Christian County voted $40,000 bonds to build roads.

Mo., St. Charles—City receiving bids Mar. 5 concrete pavement. C. Edwards, City Engr.

Mo., St. Louis—Bd. Pub. Ser. receiving bids Mar. 16 paving portions of Frisco Ave., $8450; Osceola St., $16,850; Goethe Ave., $16,250; Bischoff Ave., $13,150; Shaw Ave., $17,400; Claxton St., $19,150; Union Ave., $36,150; Union Ave., $39,350; Genevieve Ave., $41,000, brick pavement and concrete and granite curb. E. R. Kinsey, Pres.

Ark., Lake Village—Chicot County plans 45-mi. road from Louisiana State line north through Chicot County. J. C. Hoffman, Lake Village, Road Comr.

Ark., Little Rock—City sold $52,000 bonds to pave portions several streets. H. Levinson, City Engr.

Ark., Marion—Crittenden County plans $125,000 bond issue, building 40 mi. roads from Harahan Bridge. Ferree & McCleesky, Memphis, Engr. Address County Clk., Marion.

Tex., Albany—Shackelford County, Albany, Fort Griffin and Leuders Precincts, voted $100,000 bonds to build roads. Address County Clk., Albany. Noted Feb. 1.

Tex., Bay City—Matagorda County, Dist. No. 8, plans to vote on bonds for shelling roads. Address, County Clk., Bay City.

Tex., Buda—Road Dist. No. 3 sold $75,000 bonds to build roads. Address County Clk., Buda. Noted Jan. 18.

Tex., Caldwell—Burleson County plans $12,000 bond issue for paving and grading. Address County Clk., Caldwell.

Tex., Cameron—Milan County, Dist. 12, plans election to vote on $15,000 bonds to build roads. Address County Clk., Cameron.

Tex., Galveston—City plans paving Ave. O, bitulithic. About $59,000. A. F. Dickey, City Engr.

Tex., Henrietta—Council plans election to vote on $20,000 street improvement bonds and $8000 bonds to enlarge water system.

Tex., McKinney—Collin County, Allen Road Dist. No. 10, election Mar. 31 to vote on $100,000 bonds to build roads. Address County Clk., McKinney.

Tex., Waxahachie—Attorney General's Dept., Austin, approved $20,000 street paving bonds.

Okla., Blackwell—City plans paving 48 blocks.

Okla., Foss—Delaware County, Turkey Creek Township defeated $15,000 bonds to build roads. Address County Clk., Jay.

Okla., Frederick—City soon votes on bonds for paving, water system and electric-light plants.

Okla., Marble City—City election Mar. 24 to vote on $21,000 bonds for roads and bridges.

Okla., Tishmingo—Johnson County will vote Mar. 15 on $28,800 bonds to build roads in Garrett Township and on $40,000 bonds build roads and bridges in Harris Township. Address County Clk., Tishmingo.

Colo., Ft. Morgan—Morgan County will grade 60-mi. road and gravel 50-mi. road. G. S. White, Ft. Morgan, County Engr.

N. M., Alamogondo—Otero County plans $300,000 bond issue to build roads. Address County Clk., Alamogondo.

Idaho, Council—Adams County plans $80,000 bond issue to build 70 mi. of North and South Highway if State and Federal Government will appropriate $130,000 toward project. E. M. Booth, Boise, State Highway Engr.

Ariz., Clifton—Town to sell $160,000 bonds Mar. 15 to build roads.

Ariz., Douglas—City receiving bids Mar. 5 improving streets.

Wash., Auburn—King County making plans 12-mi. road between Auburn and Enumclaw. About $200,000 or $360,000. Address County Clk., Seattle.

Wash., Coupeville—Island County receiving bids Mar. 5, 3 mi. Permanent Highway No. 3. R. H. Gilespie, Coupeville, County Audr.

Wash., Ralston—Adams County soon lets contract paving portion Highway 1-B, 2-course gravel. About $23,300. O. J. DeSpain, Ritzville, County Engr.

Wash., Sprague—Lincoln County lets contract in spring building Highway No. 3, 12.56 mi. north from Sprague, including 2 concrete bridges, 50 culverts, and trestle bridge over Crabb Creek. About $40,000. G. C. Harvey, Davenport, County Engr.

Ore., Eugene—Lane County plans to spend $80,000 to repair roads during year. H. W. Libby, Eugene, County Surv.

Ore., McMinnville—Yamhill County, West Side Pacific Highway Assn., making plans 87 mi. roads. Will vote on $500,000 bond issue. Address County Clk., McMinnville.

Ore., Warrenton—Clatsop County soon lets contract 2-mi. hardsurface road. About $22,000. G. F. Parker, Astoria, County Surv.

Calif., Fairfield—Solano County, Suisun and Green Valley Dists., will issue $300,000 bonds to build 25-mi. concrete road. Address County Clk., Fairfield.

Calif., Los Angeles—Los Angeles County, Yorba Linda Road Dist. making plans grading and oiling 30-mi. roads. Address County Clk., Los Angeles.

Calif., Merced—Merced County plans election to vote on $1,250,000 bonds to build highways. Address County Clk., Merced.

Calif., Redding—City soon lets contract paving 8 blocks in business district.

Calif., San Jose—Santa Clara County will vote Mar. 15 on $1,500,000 bonds to build 80-mi. concrete highways and 100-mi. gravel roads. Address County Clk., San Jose.

Calif., Santa Barbara—Santa Barbara County plans Cuyama Rd. from northeast section of county over mountains into San Joaquin Valley. State and Federal Government may contribute to project. Address County Clk., Santa Barbara.

Calif., Yreka—Siskiyou County receiving bids Mar. 5, 3¾-mi. highway from summit of Forest House Mountain into Valley near Ft. Jones. W. J. Nelson, Yreka, County Clk.

N. B., Moncton—City plans paving Main St. J. Edington, City Engr.

Ont., Hamilton—Dominion Government and several municipalities plan 43 mi. highway from Hamilton to Niagara Falls. About $860,000.

Ont., Ottawa—Bd. Control approved plans widening portions Somerset St. About $27,000.

Bids In and Contracts Awarded

Mass., Newton—City let contract curbing, walks, steps and driveways to SIMPSON BROS., 166 Devonshire St., Boston.

N. Y., Albany—(Official)—State Highway Comn., 55 Lancaster St., received low bids completing Rd. No. 1227, Redwood-St. Lawrence County Line, Jefferson County, 4.60 mi., H. W. Roberts, Utica, $61,428, A. F. McConville, Ogdensburg, $66,864; Rd. No. 5601, Saugerties Village, Ulster County, 1.85 mi., J. Kinney Co., Inc., Buffalo, $41,236.

N. Y., Albany—(Official)—State Highway Comn., 55 Lancaster St., received low bids furnishing and delivering broken stone in Onondaga and Wayne Counties, B. S. Contract No. 73, as follows: Sidney & Johnson, Norwich, $14,691; Pathfinder Construction Co., Fulton, $14,734; McGreevey, McGuigan & Baum, Elmira, $15,032.

N. Y., Albany—(Official)—State Highway Comn., 55 Lancaster St., received low bids Feb. 20 highways in various counties as follows: Rd. No. 1486, Whitney Point-Lisle, Broome County, 2.78 mi., T. L. Ryan, Binghamton, $42,525, T. H. Gill Co., Binghamton, $43,165, N. E. Young, Jeffersonville, $43,539; Rd. No. 1487, Chenango Bridge-Kattelville, Broome County, 4.08 mi., F. Stento, Binghamton, $50,774, T. L. Ryan, Binghamton, $50,780, Woodruff-Edgecomb Co., East Branch, $51,014; Rd. No. 1492, Ellicott Creek-Gettzville, Erie County, 2.90 mi., Bison City Engineering and Contracting Co., Inc., Buffalo, $27,095, Cold Spring Construction Co., Buffalo, $27,204, L. H. Gipp, Buffalo, $27,999; Rd. No. 1493, Transit-Wolcottsburg, Erie County, 3.02 mi., Cold Spring Construction Co., Buffalo, $36,633. Bison City Engineering and Contracting Co., Inc., Buffalo, $37,376; Rd. No. 1494, Lancaster-Clinton St., Erie County, 2.34 mi., Bison City Engineering and Contracting Co., Inc., Buffalo, $40,515; Rd. No. 5523, Wells-Speculator, Part 2, Hamilton County, 6.74 mi., St. Lawrence Construction Co., Albany, $168,518; Rd. No. 1499, Scottsville-West Henrietta, Monroe County, 4.56 mi., M. H. Ripton, Rochester, $78,618, Dale Engineering Co., Utica, $78,971; Rd. No. 1396, Sheridan Boulevard-Burnside Ave and Rockaway Turnpike, Nassau County, 2.99 mi., H. J. Mullen Contracting Co., Jamaica, $114,209; Rd. No. 1424, Stone Schoolhouse-North Petersburg-Vermont State Line, Rensselaer County, 4.95 mi., C. W. Tryon, Poland, $75,606; Rd. No. 1389, Gouverneur-Edwards, Part 2, St. Lawrence County, 4.60 mi., H. P. Burgard Co., Buffalo, $71,869, R. Hopkins, Trop, $78,999; Rd. No. 5627, South Lansing-Myers, Tompkins County, 2.46 mi., D. W. Robbins, Inc., Utica, $36,906, Kennedy Construction Co., Albany, $38,902; Rd. No. 1659, Clyde-Resort, Part 3, Wayne County, 1.88 mi., Hendrickson-McCabe Construction Co., Inc., Syracuse, $16,569, A. Biggi, Albany, $16,900, Kennedy Construction Co., Albany, $18,533.

N. Y., Albany—(Official)—State Highway Comn., 55 Lancaster St., received low bids Feb. 19, highways in various counties as follows: Rd. No. 1449, Maine-Glen Aubrey, Broome County, 5.35 mi., L. Mayersohn, Albany, $71,302; Rd. No. 1450, Castle Creek-Whitney Point, Broome County, 6.93 mi., T. H. Gill Co., Binghamton, $108,800; Rd. No. 1470, Kennedy-Ellington, Chautauqua County, 4.19 mi., no proposals received; Rd. No. 1171, Afton-Coventry, Part 1 and Afton-Bettsburg, Chenango County, 7.12 mi., Paddelford & King, Sherburne, $78,446, Woodruff-Edgecomb Co., East Branch, $82,097, Frederick A. Biggi, Albany, $82,526; Rd. No. 1488, Altona-Obers Corners, Clinton County, 5.95 mi., L. Mayersohn, Albany, $68,481, Spellman-Oliver Co., Chateaugay, $69,770, F. A. Biggi, Albany, $70,478; Rd. No. 5629, Spencertown-Austerlitz, Columbia County, 5.02 mi., A. Colarusso, Hudson, $66,313; Rd. No. 1500, Marathon-Cortland, Part 4, Cortland County, 3.33 mi., S. P. Hull, Cortland, $35,351, Rossney Contracting Co., Buffalo, $36,115, D. W. Robbins Co., Inc., Utica, $36,444; Rd. No. 1445, East Aurora-Lancaster, Part 2, Erie County, 3.54 mi., Bison City Engineering and Contracting Co., Buffalo, 57,128; Rd. No. 1446, South Newstead-Peters Corners, Erie County, 0.91 mi., Cold Spring Construction Co., Buffalo, $17,384; Rd. No. 1491, Marilla-Marilla-Station, Erie County, 2.97 mi., H. E. Rainer, Buffalo, $35,490, Bison City Engineering and Contracting Co., Buffalo, $35,520, Cold Spring Construction Co., Buffalo, $42,014; Rd. No. 1458, Morehouseville-Piseco, Part 1, Hamilton County, 6.82 mi., St. Lawrence Construction Co., Inc., Albany, $129,143; Rd. No. 5590, Lewiston Heights-Lewiston, Niagara County, 0.61 mi., Kennedy Construction Co., Albany, $24,474; Rd. No. 5638, Parish-Camden, Oswego County, 5.63 mi., Spellman-Oliver Co., Chateaugay, $73,887; Rd. No. 1501, Chestertown-Hague, Part 4, Warren County, 4.59 mi., Kingsbury Construction Co., Hudson Falls, $127,919; Rd. No. 1456, Westchester Ave., Westchester County, 1.09 mi., Harlem Contracting Co., New York, $36,979, F. E. Murray Contracting Co., Inc., Portchester, $38,449, Daley & Merritt, Portchester, $38,979. Noted Feb. 19.

N. Y., New York—(Queens)—(Official)—Boro. received low bids furnishing and delivering 14,000 cu.yd. highway and asphalt sand, from C. A. Myers Construction Co., Stagg St., Brooklyn, $1.15; furnishing and delivering 30,000 cu.yd. broken stone and screenings of trap rock from Haverstraw Crushed Stone Co., 17 Battery Pl., Manhattan, $2.29.

N. Y., Olean—City let contract paving portion West State St. to D. D. DUGAN & SONS, $49,066. Noted Feb. 15.

N. J., Flemington—Bd. Freeholders, Hunterdon County let contract New Germantown-Lamington Rd. to I. DEMAREST, Sewaren. About $15,659. Noted Feb. 1.

N. J., Mt. Holly—Burlington County received low bid Moorestown-Camden Pike from J. Ginder, 303 American Mechanics Bldg., Trenton, $68,429.

N. J., Somerville—Somerset County received low bid Flagstone South Branch Rd. from Hickey & Houghton.

Md., Baltimore—State Rd. Comn. let contract 1 section road leading from Porter's Bridge to Rising Sun, Cecil County, Contract No. 048, to E. WARD BROWN, Port Deposit. Noted Feb. 1.

Md., Baltimore—State Road Comn. let contract oiling Div. Nos. 5 and 6 State Highway to GOOD ROADS CO., 212 Keyser Bldg., Baltimore, $4857 and $6440, respectively. Noted Feb. 8.

Va., Roanoke—City let contract macadamizing portion 9th St. to TINSLEY CONSTRUCTION CO.

W. Va., Fayetteville—Fayette County let contract 5-mi. concrete road to HATFIELD CONSTRUCTION CO., Huntington. Noted Jan. 25.

W. Va., Parkersburg—(Official)—City let contract paving 5000 sq.yd. to GRAHAM BROS. Noted Jan. 25.

Miss., Lucedale—(Official)—George County Comrs. will build road by day labor. Noted Feb. 8.

Ky., Covington—City let contract paving Western Ave. to F. J. RUH & SMITH CO.

Ky., Danville—Boyle County lets contract in May resurfacing 4.5-mi. old macadam roads and paving 4-mi. new roads, water-bound macadam. Address County Clk., Danville.

Ky., Newport—City let contract paving 10th St. to METZEL & O'HERN, 316 Overton Ave. About $11,536.

Ohio, Dayton—City let contract paving portion Jefferson St. to W. KERSHNER & C. F. SMITH & CO., 1401 North Main St. Noted Jan. 25.

Streets and Roads (Continued)

Ohio, Galion—(Official)—City let contract roads to RAYMOND & CALDWELL and CLEDHILL & RHINEHART. About $18,000. Noted Feb. 15.

Ohio, Newburg Heights—(Cleveland post office)—Village let contract improving several streets to ENTERPRISE PAVING AND CONSTRUCTION CO., Cleveland. Noted Feb. 1.

Ohio, Piqua—City let contract paving portions 1st and 2nd St. to J. HENNESY. About $6262. Noted Nov. 30.

Ohio, Uhrichsville—Council let contract improving Deersville Ave. to SPRINGER & RODGERS, New Philadelphia. About $16,064.

Ohio, Zanesville—Bd. Pub. Ser. rejected bids sidewalks on 4th St. and Forest Ave. W. W. Roach, Dir.

Ind., Auburn—De Kalb County let contract stone road to FULTON, STUDEBAKER & WOODARD, Bluffton. About $25,600.

Ind., Frankfort—Clinton County let contract gravel roads Perry Township to J. C. MILLER, Michigan Township to MICHAEL & KELLY, both of Frankfort; Johnson Township to SMITH & SPURGEON, Hillsboro, Ind. Noted Jan. 25.

Ind., Kokomo—Howard County let contract J. A. Martin Rd., Liberty Township, to J. H. WATSON, 204 Buckeye St. About $39,795.

Ind., Liberty—Union County let contract county line road to T. J. CONNELL, Cambridge City. About $13,675.

Ind., Martinsville—Morgan County let contract road in Ray and Jefferson Township to MANFORD ST. JOHN, Martinsville. About $9794. Noted Feb. 1.

Ind., Rockville—Parke County Comrs. let contract paving I. A. Pickard Rd. to H. & C. IRELAND. About $12,965. Noted Feb. 1.

Ind., South Bend—(Official)—St. Joseph County let contract cement road, Penn Township, to J. ACKERMAN CO., Laporte. About $26,200. Noted Feb. 8.

Mich., St. Joseph—Bd. Road Comrs. let contract 5.7-mi. road to W. W. McCRACKEN, $48,000; 4.6-mi. to W. BUDZBANOWSKI, $33,300.

Ill., Chicago—Citl let contract paving several streets to G. KEHL & SON Co., 1225 North Maplewood Ave.

Ill., Chicago—City let contract paving to P. LUSTCH, 1902 Farragut Ave.

Ill., Forest Park—City let contract paving 12th St. to REPPERT CONSTRUCTION CO., 1007 18th, Melrose Park. About $37,636. Noted Dec. 21.

Ill., Rock Island—Bd. Local Impvts. let contract paving portion 20th St. to CENTRAL ENGINEERING CO., Davenport; 6th Ave., McCARTHY IMPROVEMENT CO.

Wis., Appleton—Outgamie County let contracts road work to G. W. GROSS, La Porte, Ind., Appleton-Greenville Rd., $28,256, Hortonville-New London Rd., $48,590; PARKER & WUNDERLICH, Appleton-Mackville Rd., $28,200, Shiocton-Stephenville Rd., $21,032; GREIKE BROS., Little Chute-Kaukauna Rd., $15,105, Appleton-Brickyard Rd., $4022; T. J. McCORMICK, Seymour, Seymour-Appleton Rd.; GARVEY & WEYENBERG, paving grading and culverts on Seymour-Oneida Rd. Noted Jan. 22.

Wis., Sheboygan—City received low bid paving portion Park Ave from J. BRAUN, $7565.

Wis., Whitewater—City let contract paving various streets to E. BARTLETT, Watertown, $2.30 for vitrified brick, $1.52 rein.-con. Noted Jan. 11.

Minn., Montsvideo—City let contract paving 1st St. to FIELDING & SHEPLEY, University Ave., St. Paul. About $53,793.

Tex., Clarksville—(Official)—City let contract 44,000-sq.yd. paving and 24,000-ft. curbing to KAW PAVING CO., Topeka, Kansas. About $88,000.

Okla., Sapulpa—City let contract paving to J. E. NOLAN. About $18,146.

Wash., Friday Harbor—San Juan County rejected bids 1-mi. road on Lopez Island. J. F. Whiteley, County Clk. Noted Feb. 1.

Wash., Spokane—City let contract improving Neyada St. and Euclid Ave. to C. M. PAYNE, 724 East Mission Ave., $18,874.

Calif., Bakersfield—Kern County let contract Div. 9, Sect. 5-A, Bakersfield-Glenville Rd. to W. C. NORTHCRAFT, $17,735; Div. 9, Sect. 5, Bakersfield-Glenville Rd. to ISABELL CONSTRUCTION CO., $19,264. Noted Feb. 1.

Calif., Pasadena—City received low bid paving, 115,000 sq.ft., on Glenarm St. from T. C. Breitenstein at 9.7c. per sq.ft.

Calif., Redwood City—City let contract grading, concrete curbs, sidewalks and gutters to E. H. SUNBERG, Oakland Bank of Savings Bldg., Oakland, $34,291.

Ont., Ottawa—City let contract road improvements to TARVIA PATTERSON MANUFACTURING CO Montreal. About $97,000.

INDUSTRIAL WORKS

Proposed Work

Mass., Lawrence—H. P. Hood & Sons Co., 494 Rutherford Ave., Charlestown, making plans 2-story, 63x104-ft. creamery on Market St. About $50,000. C. T. Main, 201 Devonshire St., Boston, Arch.

Mass., Mattapoisett—C. S. Mendell, Main St., making plans 2-story, 40x60-ft. factory. About $15,000. C. Hammond & Sons, 179 South Water St., New Bedford, Arch.

Mass., Salem—Bay State Creamery, 74 North St., plans 2-story, 52x62-ft. rein.-con. factory. About $35,000. R. E. Egan, Mgr. E. T. Sanderson, 221 Essex St., Arch.

Ct., Bridgeport—R. E. Parsons Foundry Co., 432 Hallett St., made plans addition. Fletcher & Thompson, Inc., 1087 Broad St., Arch.

Ct., Bristol—Bristol Brass Co. making plans 2 factories. J. E. Lidabury, Engr.

N. Y., Binghamton—Barnes-Smith & Co., 178 Water St., making plans 3-story, 60x200-ft. factory. S. O. Lacey, Phelps Bldg., Arch. Noted Jan. 25.

N. Y., Buffalo—Lehigh Valley Railroad Co. plans additional roundhouses. About $1,000,000. E. B. Ashby, New York, Ch. Engr.

N. Y., Kingston—F. Jacobson & Son, 7 Cornell St., making plans 1-story, 30x150-ft. brick storehouse. About $10,000. M. S. Teller, Wall St., Arch.

N. Y., New York—(Brooklyn)—American Can Co., 120 Broadway, Manhattan, made plans 1-story, 109x140-ft. garage, 1st Ave. and 44th St. About $20,000. N. M. Loney, Arch.

N. Y., New York—(Brooklyn)—(Official)—S. Holding Co., 189 Montague St., made plans 1-story, 136x200-ft., brick garage, Pacific St. and Classon Ave. About $50,000. Boyle & Prowler, 189 Montague St., Arch.

N. Y., New York—(Manhattan)—U. T. Hungerford Brass and Copper Co., 80 Lafayette St., making plans storage warehouse. W. E. Austin, 46 West 24th St., Arch.

N. Y., New York—(Manhattan)—L. Kullman, Broadway and 100th St., making plans 6-story, 56x100-ft. garage. About $60,000. Jardine, Hill & Murdock, 50 East 42nd St., Arch.

N. Y., New York—(Manhattan)—J. Oshlag, 1061 Madison Ave., made plans 4-story, 50x100-ft. garage. About $45,000. J. C. W. Ruhl, 3207 Hull Ave., Arch.

N. Y., New York—(Manhattan)—Stern & Saalberg Co., 416 West 45th St., made plans 7-story, 50x100-ft. addition. About $75,000. Buchman & Fox, Madison Ave. and 42nd St., Arch.

N. Y., New York—(Manhattan)—Stern & Saalberg Co., 416 West 45th St., plans 7-story, 50x100-ft. factory, 416 West 45th St. About $90,000. Buchman & Fox, 30 East 42nd St., Arch.

N. Y., Norwich—Dairymen's League of Norwich plans creamery on Hale St. H. E. Pike, Pres.

N. Y., Sherburne—Dairymen's League of Sherburne plans creamery. C. Boos, Pres.

N. J., Newark—Gerhard Mennen Chemical Co., manufacturer of toilet specialties, has increased its capital stock from $50,000 to $1,000,000 and will extend its plant.

Pa., New Florence—Walker Foundry and Machine Co. making plans foundry. About $50,000. G. O. Rogers, 1004 Hartji Bldg., Pittsburgh, Arch.

Pa., Phila.—Gill & Co., York and Thompson St., made plans 1-story addition. Ballinger & Perrott, 17th and Arch St., Arch.

Pa., Phila.—H. H. Sheip Manufacturing Co., 6th and Columbia St. made plans addition to planing mill 6th St.

Pa., Phila.—Windsor Chocolate Co., 6th and Moore St., soon lets contract 4-story, brick and concrete addition. W. Steel & Son, 1600 Arch St., Arch. Noted Dec. 14.

Pa., Sugar Notch—L. Ferenfack Silk Co., 225 Jones St., Wilkes Barre, soon receives bids 2-story, 52x88-ft. mill. About $20,000. McCormick & French, 2nd National Bank Bldg. Arch.

Md., Canton—(Baltimore post office)—Baugh Chemical Co. soon lets contract acid plant. P. Gilchrist, Arch.

Md., Frederick—Gulf Refining Co. made plans oil distributing station. J. M. Milliken, Frick Annex, Pittsburgh, Ch. Engr.

Va., Norton—Norton Ice and Cold Storage Co. plans 48x100-ft. addition. About $18,000.

W. Va., Follansbee—Follansbee Bros. Sheet and Tin Plate Co. plans addition to open hearth furnace.

N. C., Rutherfordton—Rutherfordton Ice and Coal Co. plans 20-ton ice plant. About $50,000.

S. C., Columbia—See item under "Miscellaneous."

Ala., Anniston—American Net and Twine Co. will build plant. About $200,000.

Ala. Birmingham—Davis & Allcott Co. plans hosiery mill. About $50,000. W. B. Dabis, Attalla, Pres.

Ky., Louisville—Louisville Industrial Foundation, organizing a company to build compound lumber plant on Broadway. About $150,000.

Tenn., Columbia—Columbia Produce Co. plans warehouse and refrigerating plant. About $50,000. W. S. Beasley, interested.

Tenn., Morristown—Morristown Woolen Mills Co., $50,000 capital stock, plans 2-story factory. About $30,000.

Tenn., Spring City—Spring City Hosiery Mills plans plant. About $50,000. A. D. Paul, interested.

Ky., Louisa—Louisa Baking Co. plans 2-story, 55x100-ft. bakery.

Ky., Newport—Newport Rolling Mill Co. making plans additions to machine shop, blacksmith and generating shop. About $60,000. Tietig & Lee, 901 4th National Bank Bldg., Cincinnati, Arch.

Ohio, Akron—Akron Bitwell Tire and Rubber Co. making plans factory. About $100,000. W. C. Owens Co., 1900 Euclid Ave., Cleveland.

Ohio, Akron—Banner Foundry Co. plans foundry 216 Newton St. About $13,000.

Ohio, Cleveland—A. & M. Castings Co., 10611 Quincy Ave., making plans foundry. Forest City Engineering Co., Hippodrome Bldg., Arch.

Ohio, Cleveland—Cleveland Milling Machine Co., Ivanhoe Rd., making plans 100x100-ft. addition.

Ohio, Cleveland—Monarch Brass Co., 4613 Payne Ave., making plans factory East 45th St. About $100,000.

Ohio, Cleveland—M. D. Shanman, 4901 Woodland Ave., plans 2-story, brick factory and bathhouse, Woodland and East 51st St. About $20,000. Fulton & Taylor, Hippodrome Bldg., Arch.

Ohio, Columbus—Hydraulic Press Manufacturing Co. making plans plant. About $100,000. Stribling & Lum, 540 Denig Ferson Bldg., 85 North High St., Arch.

Ohio, Hamilton—West Side Motor Car Co., South 2nd St., made plans 1-story, 50x200-ft. garage and sales room. About $20,000. G. W. Barkman, Reilley Bldg., Arch.

Ohio, Lima—Cincinnati, Hamilton & Dayton Railroad Co. will soon let contract coach shop. F. L. Stuart, Baltimore, Ch. Engr.

Ohio, Sandusky—Hind and Dauch Paper Co. making plans brick factory, 831 Water St. About $500,000. A. M. Allen Co., 1900 Euclid Ave., Cleveland, Arch.

Ohio, Warren—Warren Tribune Co. making plans 2-story, 40x85-ft. printing plant. About $30,000. R. J. Keich, Western Reserve Bank Bldg., Arch.

Ind., Chesterton—A. J. Rader making plans 80x100-ft. factory. E. N. Braucher, 6 North Clark St., Chicago, Arch.

Ind., La Fayette—Thieme & Wagner Brewing Co., 806 North 4th St., making plans 7-story factory. J. F. Alexander & Son, Hall Blk., Arch.

Mich., Owosso—Independent Stove Co. plans addition.

Ill., Chicago—Ft. Dearborn Fireproof Storage Co., 4615 Clifton Ave., made plans storage building. C. W. Rapp, 59 West Washington St., Arch.

Ill., Chicago—Standard Ice Co., 3542 North Lincoln St., plans addition. About $25,000. Kocher & McClellan, Arch.

Wis., Antigo—C. W. Fish Lumber Co., Birnamwood, plans sawmill. About $40,000. C. W. Fish, Pres.

Wis., Milwaukee—Mi-Lola Cigar Co. plans factory, 337 4th St. About $50,000. H. Kurtz, Pres.

Wis., Racine Junction—Belle City Manufacturing Co., making plans brick and rein.-con. factory. About $45,000. A. A. Guilbert, Arch.

Minn., Kenyon—North Star Creamery Co. made plans 2-story, 36x60-ft. creamery. About $10,000. C. Kampfer & Sons, 103 Bates Ave., St. Paul, Arch.

Minn., St. Paul—La Salle Investment Co. making plans sales room to be leased by M. Burg & Sons, 2295 University Ave. About $175,000. W. R. Wilson, 1051 Marshall Ave., Arch.

Minn., St. Paul—Waldorf Paper Product Co. plans 2-story concrete warehouse on Myrtle St. About $52,000.

Kan., McPherson—Wall Rogalsky Milling Co. plans addition. About $25,000.

Neb., Omaha—Burns Baking Co., 20th and Cumming St., made plans 2-story, 49x64-ft. addition. About $15,000. A. Lawrie, 627 Paxton Blk., Arch. Noted Feb. 22.

Neb., Omaha—Gordon & Kennedy made plans 3-story, 72x90-ft. garage. About $25,000. G. B. Prinz, 1033 Omaha National Bank Bldg., Arch.

Neb., Omaha—Standard Furnace and Supply Co., 411 South 10th St., plans factory. About $70,000.

Mont., Libby—Hazel-Luckens Co. will build mill in spring. About $150,000.

Mo., St. Louis—Bush Burns Realty Co., 1105 Chestnut St., making plans 2-story, 27x144-ft. factory. About $12,000. H. W. Guth, 1105 Chestnut St., Arch.

Ark., Clarksville—Clarksville Ice Co. will enlarge plant and build warehouse.

Industrial Works (Continued)

Ark., Everton—Everton Mining and Development Co. plans concentrating plant at Davie Ross mine. J. H. Mobley, Consult. Mining Engr.

Ark., Truman—Truman Cooperage Co. will rebuild plant.

Tex., El Paso—V. E. Ware plans factory and warehouse. About $95,000.

Tex., Ft. Worth—S. P. Lee, Denver, Colo., plans automobile tire factory.

Tex., Ft. Worth—Texas Brush Manufacturing Co. plans plant.

Tex., Houston—Cotton Seed Oil Co. of Texas plans plant. About $100,000.

Tex., Houston—Houston Dairy Assn. plans dairy. About $100,000.

Tex., Orange—Orange Candy Co., recently organized, plans 2-story factory. About $10,000.

Tex., San Antonio—The Southern Welding and Machine Co. plans to build a plant. Estimated cost, $12,000. J. A. Dittman is Pres.

Okla., Heavener—Border City Ice and Cold Storage Co., Little Rock, Ark., plans ice and cold-storage plant.

Okla., Oklahoma—A. O. Campbell, 610 Majestic Bldg., made plans 2-story garage. About $35,000. Layton & Smith, 701 Majestic Bldg., Arch.

Okla., Oklahoma—Stefen-Bretch Ice and Ice Cream Co. making plans addition. About $25,-000. R. M. McCandish Engineering Co., Kansas City, Mo., Engr. Noted Dec. 7.

Okla., Tulsa—World Publishing Co., 13-14 North 4th St., making plans addition, 10-story, 50x140-ft. Rush, Endicott & Rush, 226 Unity Bldg., Arch.

Ore., Portland—Frei Pickle Works making plans plant on Macadam Rd., South Portland. F. M. White, Chamber of Commerce Bldg., Arch.

Ore., The Dalles—Wittenberg-King Co. making plans 4-story, 120x180-ft. factory.

Calif., Martinez—Shell Co. of California making plans new unit to oil refinery. Noted Feb. 22.

Calif., San Francisco—See item under "Canals, Ditches and Irrigation."

Que., St. Hyacinthe—Ducios & Payan, leather manufacturers, plan 2-story factory. About $50,-000.

Que., Sherbrooke—Mackinnon Holmes & Co. will rebuild plants recently destroyed by fire. About $40,000. F. A. Johnson, Secy.

Ont., Guelph—International Malleable Iron Co., Beverly St., plans foundry. About $15,000.

Ont., Haileybury—Riordon Pulp and Paper Co. making plans sulphite plant.

Ont., Hamilton—Carbon and Alloys Steel Co. making plans plant. About $300,000. Prack & Perrine, Arch.

Ont., Hamilton—Spectator Printing Co. making plans 10-story plant.

Ont., Hamilton—Union Drawn Steel Co. plans addition. About $50,000.

Ont., Kincardine—J. B. Watson making plans factory to manufacture reed furniture. About $50,000.

Ont., London—British Chemical Co. will build addition to smokeless powder plant in Patricia Park.

Ont., London—Imperial Munitions Bd., Ottawa plans plant for assemblying munitions.

Ont., London—Middlesex Mills Co., manufacturer of linen products will build an addition to factory and boiler house. About $35,000.

Ont., London—Quaker Oats Co. plans addition. About $100,000.

Ont., New Toronto—Brown's Copper and Brass Rolling Mills, Ltd., plans wire mill and other additions. About $50,000.

Ont., Paris—Penman Woolen Mills, Ltd., plans addition. About $50,000.

Ont., St. Catherines—Muller Flowers Electric Repairs Co. will rebuild plant recently damaged by fire. Loss, $50,000.

Ont., Toronto—Dominion Envelope Co., 90 Ontario St., plans addition. About $50,000.

Ont., Windsor—A. H. Brener, 62 Sandwich St., making plans 6-story, brick and rein.-con. factory. About $75,000. A. H. McPhail, Woolworth Bldg., Arch. Noted Feb. 8.

Man., Winnipeg—Swift Canadian Co. plans abattoir. About $3,000,000.

Sask., Saskatoon—W. A. Jenkins Manufacturing Co., London, Ont., plans branch factory. About $50,000.

B. C., Ladysmith—Ladysmith Smelting Co. making plans additions. About $100,000.

B. C., Vancouver—Armstrong Whitworth of Canada, Ltd., Montreal, Que., plans plant.

Bids In and Contracts Awarded

Me., Portland—Portland Packing Co., 26 York St., let contract factory to F. A. RUMERY CO., 51 Preble St., $10,000.

Mass., Taunton—Connecticut Mills Co., Danielson, let contract addition to F. D. WILLIAMS, 50 Weir St., $23,000. Noted Feb. 1.

R. I., Central Falls—Salembier & Clay, Hadwin St., let contract addition to weave shed to C. I. BIGNEY CONSTRUCTION CO., INC., 898 Westminster St., Providence, $20,000.

R. I., Central Falls—U. S. Knitting Co., 53 Foundry St., let contract addition to WILLMARTH MacKILLOP, INC., Freeman St., Pawtucket, $15,000.

R. I., Providence—Gerald Cooper Plant, Pomfret St., let contract dry room to O. D. PURINGTON CO., 624 Industrial Trust Bldg., $15,000.

R. I., Providence—Leader Weaving Co., 417 Mill St., let contract addition to O. D. PURINGTON & CO., 624 Industrial Trust Bldg.

Ct., Wallingford—R. Wallace & Sons Manufacturing Co. let contract plant to LOUCKS & CLARK, Ernest St.

N. Y., Batavia—F. E. Mason, 5 Lewis St., let contract factory to J. GLADE & SONS, Railroad Ave., $9000.

N. Y., Mineville—Witherbee, Sherman Co., Port Henry, let contract additions to C. MALONE, Port Henry, $20,000.

N. Y., Niagara Falls—Certain Todd Products Corp., 300 North Broadway, St. Louis, Mo., let contract factory to WIMMER CONSTRUCTION CO., Vicorria Bldg., St. Louis.

N. Y., Palmyra—Garlick Packing Co., 50 Main St., let contract factory to F. YOUNG, 819 West Colvin St.

N. Y., Poughkeepsie—Smith Bros., 181 Church St., let contract addition to KINGSTON & CAMPBELL, 1 Washington St., $15,000.

N. J., Harrison—Reuther Bros., Manor Ave., let contract foundry to J. P. BOYLE, 116 Washington St., Newark, $40,000. Noted Dec. 28.

Pa., Phila.—American Metal Works let contract factory, Louden and Stenton St. to I. T. SHOEMAKER, 6910 Mower St.

Pa., Phila.—Ferguson Carpet Co. let contract factory Stenton Ave. to ROYHOUSE-AREY CO., Fidelity Bldg., $60,000.

Pa., Phila.—I. N. Megargee & Co., Inc., 12 South 6th St., let contract addition to J. MYERS & SONS CO., Witherspoon Bldg., $15,000.

Pa., Phila.—G. Nass & Son, Broad and Vine St., let contract lumber shed to STEWART BROS., 2526 North Orkney St.

Pa., Scranton—Eureka Specialty Printing Co. let contract garage to HOWET & STENDER, Jefferson Ave. and Ash St.

Va., Norfolk—Brandt Motor Corp. let contract garage to NEFF-JONES CO., $35,000. Noted.

Va., Norfolk—F. O. Smith Shipbuilding and Dry Dock Co. let contract shops to NASH JONES, Law Bldg., $25,381. Noted Dec. 21.

Va., Saltville—Matheison Alkali Co., New York, let contract plant to D. SOENCER, Garrett Bldg., Baltimore, $100,000. Noted Dec. 21.

W. Va., Huntington—Foster-Thornburg Hardware Co., 2nd Ave. and 12th St., let contract warehouse to WATTS, CASTLE CO., 10th St. and 3rd Ave. Noted Jan. 18.

N. C., Mebane—Durham Hosiery Mills let contract mill to FISKE CONSTRUCTION CO., Greenville, S. C., $25,000.

S. C., Anderson—A. L. Todd let contract garage to C. M. GUEST, $25,000.

Tenn., Memphis—Orgill Bros. & Co. let contract warehouse to F. B. YOUNG & SONS, Memphis Trust Bldg., $100,000. Noted Feb. 1.

Ohio, Alliance—Transue Williams Steel Forging Co. let contract factory to S. AUSTIN SONS CONSTRUCTION CO., 14,230 Euclid Ave., Cleveland. Noted Dec. 28.

Ohio, Cleveland—Chisholm & Moore Co., 5046 Lakeside Ave., let contract addition to McMILLAN CO., 1794 East 55th St.

Ohio, Cleveland—Enamel Products Co., Taft Ave., let contract addition to W. DUNBAR CONSTRUCTION CO., 3210 Cedar Ave. About $15,-000. Noted Feb. 22.

Ohio, Cleveland—Feder Invest Co., Detroit and West 29th St., let contract addition to FATH CONSTRUCTION CO., 5103 Euclid Ave., $50,000.

Ohio, Columbus—McIntyre Manufacturing Co., City National Bank Bldg., let contract factory to HANSEBERGER, MARION & BERRY, 55 East State St., $25,000. Noted Feb. 15.

Ohio, Youngstown—A. H. Buehrie, Tod and West Ave., let contract warehouse and grain elevator to C. H. MEDICUS, 239 Lora Ave., $40,000. Noted Feb. 22.

Mich., Detroit—A. Colton Co. let contract addition Jefferson and Chene St. to M. BARTHOLOMAEI SON & CO., 466 Warren Ave.

Mich., Detroit—E. R. Pett & Co. let contract warehouse 237-39 Napoleon St. to F. A. DAVIDSON.

Mich., Detroit—Spranger, Rim and Wheel Co., 139 Beaubien St., let contract plant to HATCH & MONTAGUE, Ford Bldg., Noted Jan. 18.

Ill., Chicago—Chicago Transfer and Clearing Co., 38 South Dearborn St., let contract addition to E. L. ARCHIBALD CO., 111 West Washington St., $90,000.

Ill., Chicago—Montgomery, Ward & Co., Chicago Ave., let contract addition to WELLS BROS. CONSTRUCTION CO., 53 West Jackson St., $1,000,000.

Ill., Chicago—G. H. Shank, 30 North LaSalle St., let contract warehouse to SHANK CO., 30 North LaSalle St. Noted Feb. 1.

Wis., Superior—Great Northern Ry., Railroad Bldg., St. Paul, let contract grain elevator to BARNETT & RECORD CO., Flour Exchange, Minneapolis, $500,000.

Minn., Albert Lea—Albert Lea Vulcanizing Co. let contract factory to H. R. JENSEN.

Minn., Hopkins—Hopkins Coöperative Cheese Co. let contract factory to C. E. NELSON, 11th Ave., $10,000.

Minn., St. Paul—H. L. Collins, Hampden and Myrtle St., let contract factory and warehouse to P. STEENBERG CONSTRUCTION CO., 2123 Selby Ave., $35,000.

Kan., Topeka—Topeka Milling Co. let contract addition to LEHRAD CONSTRUCTION AND ENGINEERING CO., Lloyd Bldg., Kansas, Mo., $50,000.

Mo., Kansas City—Haywood Alfalfa Warehouse Co. let contract warehouse to C. E. RUDDY, 4228 St. John St., $10,000.

Mo., Kansas City—Kansas City Macaroni Manufacturing Co. let contract addition to PATTI & MOORE, 612 Massachusetts Bldg., $15,000.

Mo., St. Louis—Hamilton Brown Shoe Co., 1141 Washington Ave., let contract warehouse to MURCH BROS. CONSTRUCTION CO., Railway Exchange Bldg., $10,000.

Mo., St. Louis—J. T. Milligan & Co., 316 Clark Ave., let contract factory to J. CREWE CONSTRUCTION CO., Century Bldg., $100,000.

Okla., Alva—Kansas Flour Mills Co. let contract mill and power house to GRAY CONSTRUCTION CO., 400 Orear-Leslie Bldg., Kansas City, Mo., $47,500.

Okla., Tulsa—Central Investment Co. let contract garage to DICKINSON & THOMAS, 2nd Ave., $25,000.

Colo., Denver—Denver Rock Drill Co., 3900 Gilpin St., let contract addition to J. A. LESLIE, $100,000.

Colo., Pueblo—Purity Bread Co. let contract bakery to MARBLE BROS., $15,000. Noted Jan. 11.

FEDERAL GOVERNMENT WORK

Proposed Work

Mass., Ft. Warren—Sea Wall—W. W. Hamilton, Capt., U. S. A., Act. Quartermaster, 1020 Washington St., Boston, Mass., receiving bids Mar. 2, concrete sea wall.

Mass., Hingham—Buildings—Bureau Yards and Docks, Navy Dept., Wash., D. C., receiving bids Mar. 19, 1 magazine building and 1 shell house. F. R. Harris, Ch.

Ct., Bridgeport—Post Office—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., receiving bids Mar. 14 remodeling.

N. Y., New York—Dredging—U. S. Engr. Office, Room 802, Army Bldg., 39 Whitehall St., receiving bids Mar. 28 dredging and removing rock and boulders in Passaic River, also dredging Hackensack River, N. J. Noted Jan. 25. See adv.)

N. J., Sandy Hook—(Ft. Hancock post office)—Portland Cement—War Dept., Wash., D. C., receiving bids Mar 12, 30,000 bbl., for immediate delivery at gun and mortar pits, Sandy Hook.

Del., Wilmington—Dredging—U. S. Engr. Office, Old Federal Bldg, Wilmington, receiving bids Mar. 19, Chester River.

Tenn., Memphis—Riprap Stone—Mississippi River Comn., U. S. Engr. Office, Custom House, receiving bids Mar. 19, about 25,000 tons. Noted Jan. 11.

Wash., Bremerton—Magazine Buildings—Bureau Yards and Docks, Navy Dept., Wash., D. C., receiving bids Mar. 26, 1 guardhouse and brick extension to Building No. 18, Naval Magazine, Puget Sound. F. R. Harris, Ch.

Calif., San Diego—Repairs and Additions—Bureau Yards and Docks, Navy Dept., Wash., D. C., receiving bids Mar. 19 repairs and additions to fender piling and dolphins for coaling wharf at Naval Coal Depot.

Calif., Vallejo—Dredge—Bureau of Yards and Docks, Navy Dept., Wash., extended date receiving bids 1-ton bucket dredge for Navy Yard, Mare Island, from Feb. 26 to Mar. 6. F. R. Harris, Ch. Noted Feb. 1.

Bids In and Contracts Awarded

Ct., New Haven—Elevators—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., let contract to OTIS ELEVATOR CO., Wash., $22,924. Noted Feb. 8.

N. Y., New York—Wharf and Slip—Depot Quartermaster, Governors Island, received low bids (a) repairing wharf, (b) rack, from A. N. Spooner & Son, Inc., Pier 11, North River, (a) $6600, (b) $3533; Shelbourne & Blake Construction Corp., 267 Market St., Newark, (a) $6863, (b) $2953; J. & F. Kelly, Brooklyn, (a) $7086, (b) $2875. Noted Jan. 25.

Pa., Phila.—Cranes—Bureau of Yards and Docks, Navy Dept., Wash, received bids one 40-ton and four 10-ton bridge cranes at Navy Yard from Manning, Maxwell & Moore, 119 West 40th St., New York; Niles-Bement-Pond Co, 111 Broadway, New York; Penn Bridge Co, 313 Bond

Federal Government Work (Continued)

Bldg., Wash., D. C.; Cleveland Crane and Engineering Co., Wyckliffe, Ohio. Noted Feb. 1.

Pa., Pittsburgh—Machinery—U. S. Engr. Office, Pittsburgh, received low bids Feb. 14 lock gate operating machinery for lock No. 2, Monongahela River, from C. Hegewald Co., New Albany, Ind., $9179; J. & J. B. Milholland Co., 714 5th Ave.; Pittsburgh, $8415; S. B. Harding, 1232 Transportation Bldg., Chicago, $11,870. Noted Jan. 25.

Del., Wilmington—Dredging—U. S Engr. Office, Old Federal Bldg., Wilmington, received bids dredging Alloway Creek, New Jersey, from Delaware Dredging Co., Phila., 24c. per cu.yd., and Dorsey & Miller Co., Baltimore, 27c. per cu.yd. Noted Jan. 25.

Del., Wilmington—Dredging—U. S. Engr. Office, Old Federal Bldg., Wilmington, received bids dredging Cooper River from Delaware Dredging Co., Phila., 38c. per cu.yd., and Dorsey & Miller Co., Baltimore, 43c. per cu.yd. Noted Feb. 1.

Del., Wilmington—Dredging—U. S Engr. Office, Old Federal Bldg., Wilmington, received bids dredging Woodbury Creek, New Jersey, from Delaware Dredging Co., Phila., 19½c. per cu.yd., and Dorsey & Miller Co., Baltimore, 21c. per cu.yd. Noted Jan. 25.

Wash., D. C.—Garage—Comrs. Dist. received low bids from E. H. Mosher, $14,800; Skinker & Garrett, Wash., $14,858; D. E. Nichol, Wash., $14,900.

Va., Norfolk—Cranes—Bureau of Yards and Docks, Navy Dept., Wash., received bids one 40-ton and four 10-ton cranes at Navy Yard from Manning, Maxwell & Moore, 119 West 40th St., New York; Niles-Bement-Pond Co., 111 Broadway, New York; Penn Bridge Co., 313 Bond Bldg., Wash., D. C.; Cleveland Crane and Engineering Co., Wyckliffe, Ohio. Noted Feb. 1.

Ga., Augusta—Refrigerating Machinery—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., let contract to J. H WESTERMAN, Wash. Noted Dec. 21.

Ga., Barnesville—Post Office—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., D. C., received low bids (a) limestone, (b) sandstone from Miles & Bradt, Austin Bldg., Atlanta, (a) $39,500; Richardson Engineering and Construction Co., Bainbridge, (a) $39,690, (b) $39,990; A. Blair, Montgomery, (a) $40,219. Noted Jan. 11.

Ga., Moultrie—Post Office—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., let contract to RICHARDSON ENGINEERING AND CONSTRUCTION CO., Bainbridge, Ga., $34,770 Noted Feb. 15.

Ga., Savannah—Dredging—U. S. Engr. Office, Savannah, let contract dredging 21-ft. channel to J. EMILE, 217 Duval Bldg., $122,750. Noted Feb. 22.

Miss., McComb—Post Office—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., D. C., received low bids Feb. 16 (a) limestone, (b) sandstone, from G. A. Shaul, Seneca, Kan., (a) $40,353; A. Blair, Montgomery, Ala., (a) $42,600; Balkin Construction Co., Chicago, (a) $43,103; from W. W. Fissell, New York, (b) $50,900. Noted Jan. 11.

Tenn., Nashville—Lock—U. S. Engr. Office, Nashville, rejected bids lock "F," Cumberland River. Work to be done by day labor. Noted Feb. 15.

Ark., Mena—Post Office—J. A. Wetmore, Act. Superv. Arch., Treasury Dept., Wash., D. C., received low bids Feb. 21, (a) limestone, (b) sandstone, from Richardson Engineering and Construction Co., Bainbridge, (a) $40,700, (b) $41,500; Latimer & Benning, Kansas City, Mo., (a) $41,493, (b) $47,493; G. A. Shaul, Seneca, Kan., (a) $41,839. Noted Jan. 25.

Colo., Denver—Bridge—U. S. Rec. Ser., Dept. of Interior, let contract material for steel bridge for Garfield Crossing of Rio Grande, Rio Grande Irrigation Project, Texas-New Mexico, to WISCONSIN BRIDGE AND IRON CO., Milwaukee.

Colo., Denver—Crossings—U. S Rec. Ser., Dept of Interior, rejected bids crossings of Rio Grande at Picacho Branch Canal and Garfield Canal, Rio Grande Irrigation Project, Texas-New Mexico. Work to be done by Government forces.

Colo., Denver—Flume Material—U. S. Rec. Ser., Dept. of Interior, let contract for Garfield Crossing, Rio Grande Irrigation Project, Texas-New Mexico, to HARDESTY MANUFACTURING CO., Denver, $6831.

Wash., Bremerton—Cranes—Bureau of Yards and Docks, Navy Dept., Wash., received bids one 40-ton and four 10-ton cranes at Navy Yard from Manning, Maxwell & Moore, 119 West 40th St., New York; Niles-Bement-Pond Co., 111 Broadway, New York; Penn Bridge Co., 313 Bond Bldg., Wash., D. C.; Cleveland Crane and Engineering Co., Wyckliffe, Ohio. Noted Feb. 1.

Wash., Tacoma—Dredging—U. S. Engr. Office, Seattle, let contract city waterway to D. W. RUTHERFORD, Tacoma, $11,160. Noted Feb. 8.

Calif., San Pedro—Stripping and Excavating—U. S. Engr. Office, Los Angeles, received bids excavating for gun and mortar batteries at Ft. McArthur, from A. H. McCray Co., 422 American Bank Bldg., Los Angeles, $7310; J. A. Hill, 695 South Westmoreland Ave., Los Angeles, $8160; C. G. Willis, 327 South Los Angeles St., Los Angeles, $9140. Noted Feb. 1.

CANALS, DITCHES AND IRRIGATION

Proposed Work

N. Y., Albany—(Official)—W. W. Wotherspoon, State Supt. Pub. Works, 55 Lancaster St., receiving bids Mar. 20. Contract No. 154, Erie Canal, Sect. 8, additional Taintor gate in dam at Lock 27, Lyons, about $7803; Contract No. 159, Erie Canal, Sect. 8, placing embankment on north canal bank between Newark and Palmyra and extending the Ganargua Creek spillway, about $30,464; Terminal Contract No. 56, terminal on west side of Hudson River, north of 12th St. Bridge, Cohoes, about $61,000. (See adv.)

N. Y., Lyons—Drainage—State Conservation Comn. estimates cost of draining 1394 acres land about Black Brook at $32,360. E. H. Sargeant, Asst. Engr.

N. Y., New York—(Manhattan, Bronx, Brooklyn, Queens and Richmond)—Dredging—R. A. C. Smith, Comr. Docks, Pier "A," Battery Pl., North River, Manhattan, receiving bids Mar. 9, furnishing all labor and materials for dredging in the Boroughs of Manhattan, Bronx, Brooklyn, Queens and Richmond. Noted Feb. 1.

N. J., Cape May—Drainage—Bd. Freeholders Cape May County plan to appropriate $40,000 draining ditches, meadows Cape May and Wildwood. Address Clk., Cape May.

Pa., Wilkes-Barre—Dredging—Luzerne County received report from engineers representing Chamber of Commerce estimating cost dredging and deepening Susquehanna River from city line to Nanticoke Dam at $250,000. Address County Clk., Wilkes-Barre.

N. C., Faison—Drainage—Duplin County plans draining Goshen Swamp from Sampson County line to Northeast River by building canal 30-ft. wide and 10-ft. deep, about 20 mi., $50,000. Address County Clk., Faison.

S. C., Anderson—(Official)—Canal—Bd. Drainage Comrs., Eighteen Mile Creek Drainage Dist., receiving bids Mar. 12, Drainage canal along Eighteen Mile Creek, Anderson, Pickens and Oconee Counties. W. H. Shearer, Anderson, Engr. and Supt. Constr.

S. C., Kingstree—Williamsburg County will organize drainage district to reclaim 40,000 acres of Kingstree Swamp from Black River near Kingstree through Williamsburg County across portion Clarendon County and into Florence County. About $47,000. W. K. Wilson, Kingstree, interested. Address County Clk., Kingstree.

Ga., Marietta—Drainage—Cobb County, Acworth Drainage Assn., will drain 1500 acres. About $25,000. J. V. Phillips, Bureau Rural and Drainage Engineering, Dept. Agriculture, Engr.

Tenn., Trenton—Drainage—Forked Deer River Drainage Dist., Gibson, Madison and Crockett Counties, organized to drain about 20,000 acres. W. W. Powers, Trenton, County Judge. Noted Jan. 27.

Ky., Morganfield—Drainage—Union County will soon let contract 7 mi. open ditch work and 2½ lateral ditches, also 80 acres clearing and grubbing in H. A. Roberts Public Ditch. R. N. Orcutt, Morganfield, Engr. Noted Dec. 16, 1915.

Ind., Angola—Ditch—Steuben County receiving bids Mar. 3 Eugene F. Weicht et al. Ditch, Salem Township. L. E. Smith, Angola, Supt. Const. Noted Jan. 25.

Ind., Crown Point—Canal—Lake and Porter Counties will reclaim 22,000 acres land by means of Burns Ditch Canal which will link Little Calumet River with Lake Michigan. Address Clk. of Lake County, Crown Point.

Ill., Arthur—Drainage—Cadwell Drainage Dist. receiving bids Mar. 6, 60,000 cu.yd. ditch and 3 iron bridges. J. B. Craig, Town Clk.

Ill., Danville—Drainage—Maple Grove Drainage Dist., Vermillion County, receiving bids Mar. 5 about 18 mi. 6- to 30-in. tile, 6334-cu.yd. excavation, etc.; also 5 crossings under tracks Cleveland, Cincinnati, Chicago & St. Louis Ry. J. F. Fisher, Danville, Engr. Noted Jan. 25.

Ill., Lawrenceville—Drainage—Lawrence County made surveys 12-mi. G. C. Harvey, Mt. Carmel, Engr.

Wis., Appleton—Canal—Outagamie County organized Wolf River Valley Imprt. Assn. to build 30-mi. canal from northern to southeastern end of county. Assn. will ask Government aid. About $1,000,000. Address County Clk., Appleton.

Wis., West Allis—Drainage—City making plans draining 30,000 acres marsh land. E. R. Jones, Agricultural Dept., University of Wisconsin, Madison, interested.

Minn., Ada—Ditches—County receiving bids Mar. 8. About $25,000. D. E. Fulton, Ada, Audr.

Minn., Fairmont—Ditch—Martin County rejected bids Judicial Ditch No. 77, Cedar Township. New bids. About $25,000. H. C. Nolte, Fairmont, County Audr. Noted Jan. 18.

Minn., Jackson—Ditch—Jackson County will sell $13,000 bonds to repair Judicial Ditch No. 3. P. D. McKeller, Jackson, County Audr.

Minn., Marshall—Ditches—Lyon County receiving bids Mar. 5 County Ditch No. 36; also cleaning and repairing Judicial Ditch No. 3. About $11,263. E. S. Shepard, Marshall, County Audr. Noted Dec. 21.

Minn., Thief River Falls—Drainage—Pennington County making surveys draining Red Lake River basin. About $400,000. E. V. Willard, St. Paul, State Engr. Noted Jan. 4.

S. D., Woonsocket—(Official)—Drainage—Sanborn County Drainage Dist. No. 28 receiving bids Apr. 12, 5.4 mi. tile drain. Dakota Engineering Co., Mitchell, Engr. Noted Feb. 22.

S. D., Woonsocket—(Official)—Drainage—Sanborn County Drainage Dist. No. 30 receiving bids Apr. 12, 6.8 mi. tile drain. Dakota Engineering Co., Mitchell, Engr. Noted Feb. 22.

Mont., Plains—Reclamation—Thompson Falls Power Co. plans to reclaim about 2700 acres.

Mo., Marshall—Drainage—Bd. Supervs. approved plans Fish Creek Drainage Dist. to change channel of Fish Creek to stop overflows. A. B. Beltman, Quincy, Ill., Engr. Noted Nov. 23.

Mo., Steffenville—Drainage—Supervs. Steffenville Drainage Dist., Court House, Monticello, receiving bids Mar. 5 about 10 mi. ditches. J. G. Kaylor, Steffenville, Secy. E. T. Perkins, 1211 First National Bank Bldg., Chicago, Ch. Engr.

Ark., Arkadelphia—Drainage—Clark County organized Ross Drainage Dist. to drain about 100,000 acres in Terre Noir Valley. Address County Clk., Arkadelphia.

Ark., Arkansas City—Drainage—Southeastern Arkansas Levee Drainage Dist. will issue $1,200,000 bonds for drainage work and levees in Desha, Chicot and Lincoln Counties. Address Clk. of Desha County, Arkansas City.

Wash., Cathlamet—Reclamation—Wahkiakum County retained Barr & Cunningham, Spaulding Bldg., Portland, Ore., to make plans diking project in Wahkiakum Drainage Dist., No. 2, including reclamation of 4400 acres of Columbia River bottom land between Cathlamet and Skomokawa. About $150,000. Address County Clk., Cathlamet.

Ore., Gold Hill—Irrigation—Gold Hill Irrigation Dist. making plans 16 mi. ditches to cover 100,000 acres. About 76,800. Address G. B. Alden, Gold Hill. Noted Feb. 15.

Ore., Portland—(Official)—Drainage—Wahkiakum Drainage Dist. No. 2 retained Baar & Cunningham, Consult. Engr., 414 Spalding Bldg., on project to reclaim 20 mi. dike with necessary interior ditches, dike gates and pumping plants on Columbia River Bids about June 1.

Ore., Vale—Dam—Warm Springs Irrigation Dist. sold $750,000 bonds to complete dam and improving distributing system. J. Rigby, Vale, Engr. Noted Sept. 28.

Calif., Paradise—Irrigation—Paradise Irrigation Dist. voted $350,000 bonds for system. I. E. Goodner, Engr. Dist. S. E. Kieffer, 57 Post St., San Francisco, Constr. Engr. Noted Jan. 25.

Calif., San Francisco—Channel—H. C. Holmes and Engineering Dept. Southern Pacific Co. made plans widening channel 300-ft. and deepening to depth of 35-ft. Plans also include terminal warehouses. Cost project about $10,000,000. W. Hood, Flood Bldg., San Francisco, Ch. Engr. Ry.

Bids In and Contracts Awarded

N. Y., Albany—(Official)—Barge Canal Work—W. W. Wotherspoon, State Supt. Pub. Wks., Capital, received low bids Feb. 20 Erie Canal, Sect. 8, power station at Lock No. 29, Palmyra, Contract No. 141 from W. T. Maas & Son, 124 Railroad St., Rochester, $41,180, Scott Bros., Rome, $43,920, J. L. Richmond, Richfield Springs, $44,919; Erie Canal Sects. 4, 5 and 6, Oswego Canal, Sect. 1, furnishing and delivering oil burning lanterns for buoy, stake and bridge lights on Mohawk, Oneida, Seneca and Oswego Rivers. Contract No. 153, R. B. Wing & Son, 384 Broadway, Albany, $4389 and Lupfer & Remick, 594 Ellicott Sq., Buffalo, $9625; barge canal terminal at Mott Haven, near East 138th St., Bronx, Contract No. 44, Phoenix Construction Co., 41 Park Row, New York, $219,006. Noted Jan. 25.

N. C., Salisbury—Drainage—Grant's Creek Drainage Dist. No. 2 let contract to KARR & MOORE, $12,000.

Ga., Savannah—Canal—City let contract storm water drainage canal through Hillcrest Cemetery to CAROLINA CONSTRUCTION CO., Charleston, S. C., $44,459.

Ind., Hartford City—Ditch—Blackford County let contract Walnut Creek Ditch to CLAMME BROS., $10,854.

Ind., Monticello—Drainage—White County let contract Downey et al Ditch to V. J. MARTIN, Idaville, about 5850. Noted Feb. 1.

Mich., Flint—Drain—County let contract tile work Wilber Drain, Thetford Township, to E. O'BRIEN, Mt. Morris, about $33,000.

Ill., Havana—Drainage—Mason County, Long Branch Special Drainage Dist. let contract to M. J. O'MEARA & SONS, Beardstown, $18,592.

Ia., Hampton—Ditches—Franklin County let contract to J. H. SALISBURY, Dows, about $180,575. Noted Dec. 21.

Ia., Muscatine—Drainage—City received low bid sanitary and storm drainage system from R. Like, Davenport, $5531 and $5238.

Ia., Primghar—(Official)—Ditch—O'Brien County let contract Drainage Dist. No. 4 to L. L. KRAMME Ft. Dodge, $6025 labor; CEMENT PRODUCTS CO., Spencer, $15,105, materials. Noted Feb. 8.

Ia., Sac City—Drainage—Sac County let contract in Goose Pond Dist. No. 60 to J. H. BOYCE, Omaha, Neb., $63,597. Noted Dec. 7.

Canals, Ditches and Irrigation (Continued)

Ia., Spirit Lake—Ditches—Osceola and Dickenson Counties let contract open ditch work to LINMAN & CHANCY, Fonda, $97,052, tile to CEMENT PRODUCTS CO., Spencer, $97,298.

Minn., Fairmont—Ditch—Martin County let contract Judicial Ditch No. 70 to MINNESOTA PIPE AND TILE CO., $12,806.

Minn., Glencoe—Ditches—McLeod County received low bid. Ditch No. 30 from Ajax Dredge Co., Glencoe, $11,230.

Minn., Mankato—(Official)—Ditch—Blue Earth County let contract Judicial Ditches No. 14 to JUDSON CONCRETE CO., Judson, $5395; No. 17 to P. PAULSON, Carroll, Ia., $11,155; No. 18 and No. 19 to A. HANSON, Lake Crystal, $8480. Noted Feb. 8.

Minn., St. Peter—Ditch—Nicollet County let contract Ditch No. 65 to TRACY CONSTRUCTION CO., Tracy, $20,250. Noted Jan. 25.

Idaho, Twin Falls—Canal—Twin Falls Canal Co. let contract lining canal with concrete to LORD CONSTRUCTION CO., Hamilton, Mont., and H. G. HILKERSON, Salt Lake City. About $70,000.

Wash., Otis Orchard—Irrigation—Otis Orchard Irrigation Dist. let contract irrigation ditches and flumes near Deer Park to C. APPLEGATE CO., Butte, Mont., $10,000. Noted Jan. 25.

Calif., El Centro—Irrigation—Imperial Irrigation Dist let contract excavating new Tecolote canal, important link in water diversion system to E. F. SHIELDS, San Diego, $92,000.

MISCELLANEOUS

Proposed Work

Ct., Bridgeport—Park—See item under "Streets and Roads."

N. Y., New York—(Manhattan)—Fire-Alarm Posts—R. Adamson, Fire Comr., 11th Floor, Municipal Bldg., receiving bids Mar. 7 furnishing and delivering upper parts of 161 fire-alarm posts.

N. Y., New York—(Manhattan)—Fire-Alarm Posts—R. Adamson, Fire Comr., 11th Floor, Municipal Bldg., receiving bids Mar. 7 furnishing and delivering 1400 twin fire-alarm posts. Noted Feb. 15.

N. Y., New York—(Manhattan)—Fire-Signal Systems—J. A. Kingsbury, Comr. Pub. Charities, 10th Floor, Municipal Bldg., receiving bids Mar. 21 furnishing all labor and materials required for the installation of fire-signal systems in various groups of buildings.

N. Y., New York—(Queens)—Cables, etc.—R. Adamson, Fire Comr., 11th Floor, Municipal Bldg., Manhattan, receiving bids Mar. 5 furnishing, delivering and installing underground lead cables and appurtenances for Rockaway Improvement.

N. Y., New York—(Queens)—Pipes, etc.—R. Adamson, Fire Comr., 11th Floor, Municipal Bldg., Manhattan, receiving bids Mar. 5 furnishing, delivering and installing subsidiary pipes, delivering and installing fire-alarm posts and constructing manholes for Rockaway Improvement.

N. J., Asbury Park—(Official)—Smoke Stack, etc.—Bd. Comrs. receiving bids Mar. 6, 2 steel or iron smoke stack with necessary appendages. H. B. White, City Clk. Noted Feb. 1. (See adv.)

N. J., Belmar—Jetty—Town asked legislature to appropriate $20,000 towards completing and extending jetty work on Shark River Inlet. T. F. Appleby, Asbury Park, interested.

N. J., Perth Amboy—Park Improvements—Bd. Alderman passed ordinance authorizing bond issue $124,000 for park improvements; $165,000 street improvements; $40,000 sewer work.

N. J., Trenton—Waterway—Legislature plans to appropriate $50,000 extensions to inland waterway from Bay Head to point near Manasquan River. Address Bd. Commerce and Navigation.

Pa., Johnstown—River Wall—City plans to issue $50,000 bonds to build river wall. J. R. Crissey, City Engr.

Pa., Phila.—(Official)—Pier—G. S. Webster, Dir. Dept. Wharves, Docks, Ferries, 550 Bourse Bldg., receiving bids Mar. 15, Schedule "A," pier construction with appurtenant work in Delaware River foot Kenilworth St.; Schedule "B," driving test piles in Delaware River at Penn Treaty Pier; Schedule "C," dredging canal at foot Venango St., Delaware River. Noted June 8. Plans and specifications on file at New York office of "Engineering News." (See adv.)

Pa., Phila.—Subway—Dept. City Transit receives bids about Mar. 20 section Broad St. subway. G. E. Dateman, Dir. Pub. Ser. C. Albright, City Engr. Noted Feb. 1.

Md., Indian Head—Tunnels—See item under "Railways."

Va., Newport News—Boat Harbor—City voted $50,000 bonds to improve boat harbor. T. E. Pearse, City Engr. Noted Mar. 2.

W. Va., Charleston—Subway—Kanawha & Michigan Ry. to build under tracks on Florida St. by company's force. About $15,000. C. M. McVay, Charleston, Engr. M. W. Noted Feb. 22.

S. C., Columbia—Wharf, etc.—Chamber of Commerce recommended that City Council issue $50,000 bonds for wharf and warehouse on Congaree River near Granby.

Fla., St. Petersburg—Seawall, etc.—City voted $133,000 bonds for seawall, fill, etc. Noted Jan. 25.

Ky., Barbourville—Pipe Line—Cumberland Pipe Line Co. plans 4-in. line from point near Campton, Wolf County, to West Virginia refineries.

Ohio, Lorain—Elimination Grade Crossings—Lorain, Ashland & Southern R.R. making plans on Broadway. J. P. Ramsey, Ashland, Ch. Engr. and Supt.

Ind., Indianapolis—Retaining Wall—See item under "Bridges."

Ill., Danville—Crossings—See item under "Canals, Ditches and Irrigation."

Wis., Milwaukee—Road Oil—Bd. Pub. Wks. receiving bids Mar. 14, 50,000, 200,000 and 50,000 gal. respectively road oil and 200,000 and 100,000 gal. respectively bituminous road binder to be used hot. G. Staal, City Engr.

Mo., Kansas City—Dam—City making plans 10x240-ft. near 9th St. on Blue River. About $50,000. Harrington, Howard & Ash, Orear-Leslie Bldg., Engr.

Mo., Kansas City—Retaining Wall—See item under "Bridges."

Mo., St. Louis—Dike—Bd. Pub. Ser. receiving bids Mar. 6 hurdle dikes extending into Mississippi River at Chain of Rocks. Noted Jan. 18. E. R. Kinsey, Pres.

Mo., St. Louis—Elimination of Grade Crossings—Bd. Pub. Wks., Chicago, Rock Island & Gulf Ry. and Wabash Railway Co. plan on northern boundary Forest Pk. About $1,500,000. E. R. Kinsey, Pres. Bd. Pub. Wks.

Ark., Little Rock—Levee—Plans of Southeast Arkansas Levee Dist. including 1,000,000 acres approved by Governor. District will issue $1,200,000 bonds for work.

Tex., Dallas—Levee—Property owners in Bois d'Arc Reclamation Dist. plan to incorporate and issue about $250,000 bonds to be used to build levee 14 mi. long opposite Dallas County levee Dist. No. 1 to reclaim from 13,000 to 15,000 acres.

Idaho, Lewiston—Culverts, etc.—County receiving bids Mar. 5 iron culverts of from 8- to 30-in. sizes; road graders, standard sizes; slip and Fresno scrapers, etc. R. N. Wright, Lewiston, County Clk.

Wash., Seattle—Raising Grade—See item under "Railways."

Wash., Tacoma—River Improvement, Pierce County approved plans W. J. Roberts, Ch. Engr. Inter-County River Imprvt. Assn., Court House, improving Puyallup River. Plans call for expenditure of $100,000 for year 1917 to cover cost 20,000 lin.ft. permanent bank protection, requiring 10,000 bbl. cement, 150,000 sq.ft. triangle mesh reinforcement and 10,000 lb. plain black wire and 40,000 lin.ft. 2nd hand cable. Bids to be received Mar. 8 for 5000 tons rock and 5000 cords brush and lumber for forms.

Calif., Los Angeles—(Official)—Tunnel—Bd. Pub. Wks. receiving bids Mar. 26 through Bunker Hill at 2nd St. About $800,000. R. N. Stewart, Engr. Bridges and Struct. Noted July 27.

Ont., Hamilton—Cement, Broken Stone, etc.—City receiving bids Mar. 5 supplying cement, broken stone and screenings, asphalt, hydrants valves, etc., until Mar. 1, 1918. S. H. Kent, City Clk.

Bids In and Contracts Awarded

N. Y., New York—(Manhattan)—(Official)—Pipes, etc.—R. Adamson, Fire Comr., 11th floor, Municipal Bldg., received low bid subsidiary pipes and fire-alarm posts from 14th to 82nd St. from Hickey Construction Co., 841 Broadway, $31,881. Noted Feb. 15.

N. Y., New York—(Manhattan)—(Official)—Pipes, etc.—Fire Comr., 11th floor, Municipal Bldg., received low bid subsidiary pipes and fire-alarm posts south of 14th St. from Hickey Construction Co., 841 Broadway, $43,127. Noted Feb. 15.

Wash., Olympia—Dock, Slips, etc.—Sloan Shipyard Corp. let contract to H. MALLORY, Olympia, about $25,000.

BUILDINGS

Proposed Work

Other items relative to Building Construction will be found under the following headings: "Industrial Works," "Federal Government Work" and "Miscellaneous."

N. H., Manchester—Exchange—New England Telephone and Telegraph Co., 50 Oliver St., Boston, made plans 3-story, brick and stone. Densmore & Le Clear, 88 Broad St., Boston, Arch.

Vt., Burlington—Hospital—De Boesband Hospital making plans. About $150,000. McDowell, Henderson & Mercer, 148 College St., Arch.

Mass., Boston—Library—City plans enlarging Boston Public Library. About $2,000,000. E. F. Murphy, Comr. Pub. Wks.

Mass., Boston—School—Bd. Education making plans 2-story, 152x160-ft. J. P. Lomasney, School House Comr. Funk & Wilcox, 120 Boylston St., Arch.

Mass., Boston—Society and Office—United Society of Christian Endeavor making plans 5-story. H. B. Grose, 15 Ashburton Pl., Chn. Bldg. Com. Brainers & Leeds, 89 Franklin St., Arch.

Mass., Boston—Theater and Store—C. J. Gorman Amusement Enterprise, 294 Washington St., made plans 1-story. About $45,000. J. Maginnis, 16 Arlington St., Arch.

Mass., Boston—General Real Estate Trust plans 6-story, brick building, 28-29 Portland St. About $60,000.

Mass., Boston—Woman's Bd. of Trade plans 12-story, brick and stone building, 468-472 Boylston St. About $650,000.

Mass., Boston—Synagogue—Beth Hamedash Hagodol Congregation making plans addition. F. A. Newcross, 46 Cornhill St., Arch.

Mass., Fall River—Theater—N. S. Laudelin, 11 Choate St., making plans, Bedford and 15th St. L. A. Gordon, 209 Granite Bl., Arch.

Mass., Holyoke—Hospital—Holyoke City Hospital plans additions. W. F. Whiting, Pres. of Trustees.

Mass., Holyoke—Church—Unitarium Congregation plans.

Mass., Revere—School—Bd. Education plans in Crescent Beach Sect.

Mass., Rockport—Society—Spiran Lodge, O. of V., recieving bids 2½-story. H. M. Hanson, 119 Main St., Gloucester, Arch.

Mass., Springfield—Fire Station—City plans. F. H. Clark, City Engr.

Mass., Worcester—School—City making plans. C. R. Hoyle, Sleter Bldg., Arch.

Mass., Weymouth—School—Bd. Education making plans Nevins School. About $62,000. Hoyt & Bixby, 8 Beacon St., Boston, Arch.

R. I., Providence—Providence College making plans buildings. About $2,500,000. M. Harkins, 30 Fenner St., Bishop. M. Sullivan, 100 Boylston St., Boston, Arch.

R. I., Providence—Hotel—Narragansett Hotel made plans addition. Bliss & Lavalle, Arch. J. E. Fletcher, Prop.

Ct., Bridgeport—Hospital, Etc.—See item under "Streets and Roads."

Ct., Naugatuck—Home—Y. M. C. A. plans. H. B. Tuttle interested.

Ct., New Haven—Parish House—Calvary Baptist Congregation making plans. About $65,000. Johnson & Burns, Inc., 26 State St., Hartford, Arch.

Ct., Norfolk—School—Bd. Education plans. J. M. Colburn, Chn.

N. Y., Albany—Temple—Odd Fellows plans to rebuild temple destroyed by fire. 6-story. G. C. Hisgen, c/o Hisgen Bros., Tivoli, Albany, Chn. Bldg., Com. Obenaus & Nichols, Inc., 119 State St., Arch.

N. Y., Cahteaugay—Church—St. Patrick's Congregation made plans 1½-story. About $75,000. D. D. Kieff, 17 Flower Bldg., Watertown, Arch.

N. Y., Elmira—Library—City making plans at Lake and East Church St. for Steele Memorial Library. About $100,000. H. D. Whitfield, 160 5th Ave., New York, Arch.

N. Y., New York—(Bronx)—(Official)—Hospital)—A. Goldman, 1385 Fulton Ave., Brooklyn, made plans 2-story, brick, 50x77-ft. About $50,000. L. A. Abramson, 220 5th Ave., Arch.

N. Y., New York—(Brooklyn)—Bath—E. Schumer receiving bids 3-story, 40x108-ft. About $55,000. Shampan & Shampan, 772 Broadway, Arch.

N. Y., New York—(Brooklyn)—Hospital—Cumberland Street Hospital, c/o City of New York Dept. Pub. Charities, making plans 8-story, brick, stone and rein.-con. on North Portland Ave. About $600,000. Bids will soon be received. Ludlow & Peabody, 101 Park Ave., Manhattan, Arch.

N. Y., New York—(Manhattan)—Home—S. Untermeyer, Pres., Andrew Freedman Foundation Home for Aged, making plans, Grand Blvd. and Concourse at 166th and 167th St. About $350,000. Buchman & Fox, 30 East 42nd St., Arch.

N. Y., White Plains—(Official)—Store—J. H. McArdle, Mamaroneck, made plans 3-story, brick, 43x160-ft. About $55,000. A. C. G. Fletcher, 103 Park Ave., New York, Arch.

N. J. Belmar—Hotel—S. Michelson, 603 10th Ave. plans. About $50,000.

N. J., East Orange—City Hall—City plans. About $200,000.

N. J., Kearney—(Arlington Post Office)—School—Bd. Education plans. About $200,000.

N. J., Passaic—School, Church and Parish House—Church of the Holy Rosary Congregation receiving bids 3-story. J. F. Kelly, Post-Office Bldg., Arch.

N. J., Newark—High School—Bd. Education made plans East Side Public Manual Training and Commercial High School, 3-story, 47x138-ft. F. H. Sommer, Pres. L. Sonntag, City Hall, Arch.

Pa., Chester—Hospital—Chester Hospital making plans several buildings, brick and concrete. J. T. Windrim, Phila., Arch.

Buildings (Continued)

Pa., Easton—Mausoleum—Directors Easton Cemetery Co. plan. About $50,000.

Pa., Harrisburg—(Official)—Harrisburg Hotel Co. receiving bids about Apr. 1, Hotel Penn Harris, 10 or 12-story. About $700,000. W. L. Stoddart, 9 East 40th St., New York, Arch. Noted Feb. 15.

Pa., Johnstown—School—Bd. Education making plans, brick, concrete and steel. About $200,000. J. E. Adams and G. Wild, 734 Main St., Arch.

Pa., Phila.—Freighthouse and Office—Pennsylvania R.R. making plans, 1-story, brick and steel, Roberts and King St. A. C. Shand, Broad St. Sta. Phila., Ch. Engr.

Pa., Phila.—Store—Lit Bros. making plans 7-story addition. Simon & Bassett, 1114 Chestnut St., Arch.

Pa., Phila.—Club—Musical Art Club plans 3-story.

Pa., Pottstown—High School—Bd. Education plans. W. W. Rupert, Supt.

Del., Wilmington—School—Bd. Education plans $500,000 bond issue to build 5 schools.

Wash., D. C.—Bank—Home Savings Bank, 7th and Massachusetts Ave., N. W., making plans 6-story, 35x120-ft. About $100,000. B. S. Saul, Pres. Clark Waggman, 1211 Connecticut Ave., Arch.

Va., Hampton—Memorial Building—City plans R. C. Ogden Memorial Building.

Va., Petersburg—Schools—Bd. Education plans 2 schools, 3-story. About $100,000. P. W. Smith, Chn. F. M. Martin, Clk. C. M. Robinson, Times-Dispatch Bldg., Richmond, Arch.

W. Va., Charleston—Theater and Office—W. F. Gray, 133 North Main St., and J. B. Kay & Co., Fourth National Bank Bldg., made plans 6-story, 100x135-ft. About $300,000.

W. Va., Charleston—Home and Church—Union Mission Settlement receiving bids about Mar. 15, 3-story, 56x100-ft. P. D. Withrew, Supt. J. L. Montgomery, 404 Coyle-Richardson Bldg., Arch.

W. Va., Charleston—Church—St. John's Episcopal Congregation receiving bids about Mar. 15, remodeling and addition, 1-story. About $60,000. H. R. Warne, Masonic Temple Bldg., Arch.

W. Va., Huntington—Business—A. Solof plans 3-story. About $75,000 to $100,000.

W. Va., Huntington—Hotel—J. S. Farr making plans 7-story, 70x120-ft. About $100,000. Meanor & Sweeney, Milton Bldg., Arch.

W. Va., Martinsburg—Office—Adams Express plans, brick.

W. Va., Wheeling—West Virginia University soon lets contract Agricultural Hall. About $100,000. John Lee Coulter, Dean.

N. C., Charlotte—Schools—City election Mar. 20 to vote on $350,000 bonds to build schools. H. P. Harding, Supt.

N. C., Charlotte—Hospital—Presbyterian Hospital Trustees plan. About $75,000.

N. C., Greensboro—Court House—Guilford County plans at West Market St. and Sycamore St. About $140,000.

N. C., Greensboro—(Official)—Hotel—City soon receives bids 7-story, 75x143-ft. About $300,000. W. L. Stoddart, 9 East 40th St., New York, Arch. Noted Feb. 8.

S. C., Greenville—High School—Greenville School Trustees receiving bids Apr. 3. About $55,000 or $70,000.

S. C., Greenwood—Church—Main St. Methodist Congregation receiving bids Mar. 15. About $40,000. Summer & Harrell, Greenwood, Arch.

Ga., Athens—Hospital—St. Mary's Hospital plans.

Ga., Macon—Freight Depot—Central of Georgia Railway plans. C. K. Lawrence, Savannah, Ch. Engr.

Fla., Ft. Pierce—Hotel—Ft. Pierce Hotel Co. made plans 3-story. About $40,000. F. H. Trimble, Fellsmere, Arch.

Fla., Tampa—Hospital—J. Helms, M. D., L. F. Carlton, and associates, organized company with capital stock of $50,000 and plans William Pitt Lawrence Hospital.

Ala., Bessemer—High School—City plans election to vote on bond issue to build high school.

Miss., Charleston—Hotel—W. B. Burke and others plan 3-story, 37x138-ft. R. B. Spencer, Jackson, Arch.

La., New Orleans—Hotel—St. Charles Hotel plans 5-story addition.

La., Shreveport—C. C. McCloud making plans addition to Colonial Hotel. About $50,000.

Tenn., Kingsport—Carolina, Clinchfield & Ohio Ry. plans rebuilding passenger station damaged by fire. About $50,000. O. K. Morgan, Johnston City, Ch. Engr.

Tenn., Memphis—Sanitarium—City plans. J. H. Weatherford, City Engr.

Tenn., Memphis—Theater—M. Loew, New York, plans. About $75,000.

Tenn., Morristown—Dormitory—Morristown Normal and Industrial College plans. About $40,000.

Ky., Lebanon—High School—City election Mar. 10 to vote on $40,000 bonds to build high school.

Ohio, Ashley—(Official)—School—Bd. Education receiving bids Mar. 6. About $42,000. Allen & Hall, 420 Hayden Clinton Bank Bldg., Columbus, Arch. Noted Feb. 22.

Ohio, Bedford—School—Bd. Education receiving bids Feb. 28, sale of $50,000 bonds to build school. E. Senter, Clk.

Ohio, Bellaire—Depot—Baltimore & Ohio Railroad Co. plans. R. N. Begien, Baltimore, Ch. Engr.

Ohio, Cincinnati—Depot—Southern R.R. plans, Clark and Liberty St. About $15,000,000. W. H. Wells, Wash., D. C., Ch. Engr. M. W. and Struct.

Ohio, Cincinnati—Store—A. W. Helfrick, receiving bids Mar. 7, 3-story, brick, 2526 Vine St. E. H. Kruckemeyer, St. Paul Bldg., Arch.

Ohio, Cincinnati—Hospital—Longview Hospital made plans addition. About $250,000. Elzner & Anderson, Ingalls Bldg., Arch.

Ohio, Cleveland—Bathhouse—See item under "Industrial Works."

Ohio, Cleveland—Natatorium—Cleveland Natatorium Co., c/o A. F. Walthers, 418 American Trust Bldg., plans on East 66th St. About $50,000.

Ohio, Cleveland—Public Hall—City plans, East 6th St. and Lakeside Ave. R. E. Collins, City Clk.

Ohio, Columbus—Gymnasium—Bd. Education receiving bids Mar. 6. E. B. McFadden, Clk.

Ohio, Columbus—Ohio State University plans building. About $250,000. W. O. Thomas, Pres.

Ohio, Columbus—Hotel—H. Bayer, 139 East Town St., plans 6-story, 527-528 North High St.

Ohio, Convoy—School—Bd. Education making plans 2-story, 60x90-ft. About $45,000. B. A. Snyder, Pres. Leech & Leech, 7 Public Sq., Lima, Arch.

Ohio, Dayton—Home—Dayton Turnagemeinde plans, Brown and Hess St. C. Nagel, interested.

Ohio, Edgemont—(Cincinnati post office)—Theater—J. A. Reichert making plans 2-story, brick, Cincinnati St. and Bolender Ave. A. F. Moyer, Louis Bldg., Arch.

Ohio, Galion—High School—Bd. Education receiving bids in April. Howard & Marion, 8 East Broad St., Columbus, Arch.

Ohio, Portsmouth—School—Bd. Education making plans 2-story. About $60,000. W. C. Hazelbach, Royal Association Bldg., Clk. Ritter & Bates, 35 First National Bank Bldg., Arch.

Ohio, Sardinia—High School—Bd. Education making plans. Weber & Weber, 414 Walnut St., Cincinnati, Arch.

Ohio, Toledo—Hotel—Park Hotel, Knopp and Wade St., made plans 3-story addition. About $40,000. Mills, Rhines, Bellman & Nordoff, Ohio Bldg., Arch.

Ind., Bourbon—School—Bd. Education made plans 2-story. About $60,000. S. Craig, Warsaw, Arch.

Ind., East Chicago—High School—East Chicago High School making plans addition. About $100,000. J. T. Hammond & Son, Hammond Bldg., Hammond, Arch.

Ind., Ft. Wayne—Hospital—Hope Hospital soon lets contract 6-story. About $110,000. A. G. Bury, Pres.

Ind., Ft. Wayne—Hotel—W. H. Knapp, Baltes Hotel, plans 12-story. About $400,000.

Ind., Hammond—High School—Bd. Education made plans addition, 3-story, 71x176-ft. A. J. Dressen, Hohman St., Secy. J. T. Hatton & Son, 314 Hammond Bldg., Arch.

Ind., Kokomo—Church—First Church of Christ, Scientist making plans 2-story. About $40,000. M. P. Elliott, c/o Haynes Auto Co., Arch.

Mich., Ann Arbor—Infirmary—Washtenaw County receiving bids Mar. 8. R. W. Koch, Ann Harbor, Arch.

Mich., Detroit—City making plans House of Correction. About $1,000,000. G. H. Fenkell, Trustee. Smith, Hinchman & Grylls, 710 Washington Arcade, Arch.

Mich., Detroit—Bank and Office—J. Couzens, 2239 Dime Bank Bldg., made plans 2-story, 100x180-ft. A. Kahn & E. Wilby, 58 West La Fayette Blvd., Arch.

Mich., Detroit—Club—Automobile Country Club plans at Pine Lake. About $150,000. R. B. Tannihill, R. Barre and W. C. Hartman, Dir.

Mich., Detroit—School—City making plans 2-story, on Emerson Ave.

Mich., Flint—Temple, Store and Office—Fraternal Order of Eagles made plans. About $100,000. G. J. Bachman, 302 South Saginaw St., Arch.

Mich., Lansing—Hospital—University of Michigan plans. About $1,000,000. H. B. Hutchins, Pres.

Mich., Pontiac—Schools—Bd. Education made plans additions, $150,000 bonds voted for work. Perkins, Fellow & Hamilton, Fisher Bldg., Arch.

Ill., Chicago—Church—St. Ambrose Congregation making plans addition. About $50,000. Z. T. & C. G. Davis, 64 East Van Buren St., Arch.

Ill., Chicago—Dispensary—University of Chicago plans.

Ill., Chicago—Theater—E. Browarsky plans 3-story, 26th St. and Crawford Ave. About $350,000. H. L. Newhouse, 4630 Prairie Ave., Arch.

Ill., Danville—Bank and Office—First National Bank made plans 10 or 12-story. About $150,000 to $175,000. C. L. English, Pres. Muncie & Jensen, 39 South La Salle St., Chicago, Arch.

Ill., Kewanee—Hospital—St. Francis Hospital plans addition. About $75,000.

Ill., Pekin—Bath House—Park Comrs. receiving bids Apr. 1, Mineral Springs Park. E. W. Wilson, Member.

Ill., Peoria—School—Bd. Education plans.

Ill., Quincy—High School—Bd. Education plans. F. Penick, Member.

Wis., Eau Claire—Sacred Heart Hospital plans dormitory, laundry and power house. About $50,000. Foeller & Schober, 123 North Washington St., Green Bay, Arch.

Wis., Fond du Lac—School—City election in April to vote on $60,000 bonds to build vocational and continuation school.

Wis., Madison—Bank and Office—Bank of Wisconsin making plans 6-story, 42x110-ft., brick, rein.-con. and stone. Childs & Smith, 122 South Michigan St., Chicago, Arch.

Wis., Madison—Church—Wesley Foundation Methodist Congregation making plans brick, steel and concrete. About $225,000. Childs & Smith, 122 South Michigan St., Chicago, Arch.

Wis., Manitowoc—Home—B. P. O. Elks plan, 3-story. About $500,000.

Wis., Milwaukee—Administration and Hospital—City making plans 19th and Mitchell St., 2-story, 50x50-ft. C. E. Maig, City Hall, Arch.

Wis., Milwaukee—(Official)—Bank—Wisconsin National Bank does not plan 17-story on Waldham site as stated in our issue of Feb. 8.

Wis., Milwaukee—School—State Bd. Normal Regents, Madison, making plans, Downer and Kenwood Ave. About $125,000.

Wis., Racine—Armory and Auditorium—City plans. About $49,435. A. A. Guilbert, 201 6th St., Arch.

Wis., Waukesha—Club House—Elks Club plans addition.

Ia., Aplington—School—Bd. Education made plans 2-story, 66x144 ft. About $50,000. W. L. Pedicord, Cuplin Bldg., Iowa Falls, Arch.

Ia., Council Bluffs—High School—City election in March to vote on $175,000 bonds to build high school.

Ia., Mapleton—School—Bd. Education plans election in spring to vote on $95,000 bond issue to build school.

Ia., Mason City—(Official)—Y. W. C. A. receives bids in about 60 days for building, $60,000. Shattuck & Hussey, 19 South La Salle St., Chicago, Arch. Noted Feb. 8.

Ia., Mason City—Temple—A. F. & A. M. No. 145 plans. About $100,000. C. P. Shipley, Secy.

Ia., Oskaloosa—High School—City receiving bids Mar. 16 addition to high school. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, Arch.

Ia., Pella—Hospital—Women's Federated Clubs plan. About $50,000.

Minn., Crookston—Academy—St. Joseph Academy made plans addition, 2- and 3-story, 60x100 ft. C. N. Morin, Argyle, Wis., Arch.

Minn., Fergus Fall—Hotel—A. Kaddatz plans addition to Hotel Kaddatz. About $60,000.

Minn., Remer—School—Bd. Education making plans. E. F. Broomhall, 710 Alworth Bldg., Duluth, Arch.

Kan., Bogue—School—Bd. Education receiving bids Mar. 5. H. B. Winter, Manhattan, Arch.

Kan., Concordia—School—Bd. Education making plans, brick. About $60,000. W. E. Hulse & Co., First National Bank Bldg., Hutchinson, Arch.

Kan., Eldorado—Hospital—A. Preston, M. D., interested in project to build hospital.

Kan., Eldorado—Temple—Masonic Temple plans. About $40,000.

Kan., Hoxie—Court House—City making plans, 2-story, brick, stone and rein.-con. About $60,000. T. W. Williamson & Co., 418 Central National Bank Bldg., Topeka, Arch.

Kan., Independence—Bank and Office—Commercial National Bank soon receives bids, 6-story, brick and rein.-con. Hoggson Bros., 485 5th Ave., New York, Arch.

Kan., McPherson—High School—City election Apr. 3 to vote on $50,000 bonds to build high school. F. H. Hawley, Pres. Bd. Education.

Kan., Manhattan—School—Bd. Education plans $40,000 bond issue to build school. R. B. Spilman, Secy.

Buildings (Continued)

Kan., Pratt—High School—Bd. Education plans. About $85,000.

Kan., Sedan—Court House—Chautauqua County making plans 3-story, 68x52-ft. About $50,000. G. P. Washburn & Son, Arch.

Kan., Talmadge—Church—Methodist Episcopal Congregation receiving bids Mar. 19. F. B. Benson, Chn.

Kan., Wichita—Theatre and Office—W. F. Gray plans 6-story. About $300,000.

Kan., Wichita—Hotel—Wichita Hotel Corporation made plans 10-story. About $425,000. E. E. Bessire, Pres. Smith, Rea and Lovitt, Finance Bldg., Kansas City, Mo., Arch.

Kan., Wichita—Wichita Hospital plans Nurses' Home. About $70,000.

Neb., College View—School—City defeated $40,000 bond issue to build school.

Neb., Humphrey—Club House—Knights of Columbus plan. About $45,000.

Neb., Omaha—High School—Bd. Education made plans Commerce High School. About $600,000. John Latenser & Son, Arch.

Neb., Randolph—Church—St. Frances Congregation making plans 1-story, brick and stone. About $40,000. W. L. Steele, 502 United States Bank Bldg., Arch.

Neb., Sutton—Community—New York Agriculture Society plans. About $50,000.

Neb., York—Community—York County Agricultural Society plans. About $50,000.

Neb., York—High School—Bd. Education plans rebuilding. About $60,000.

S. D., Lake Andes—Court House—Charles Mix County receiving bids Apr. 1. About $150,000. Address County Clk., Wheeler. Noted Feb. 1.

S. D., Redfield—State Bd. Charities and Corrections receiving bids Mar. 6, main building at State School for Feeble Minded. W. H. King, Secy.

N. D., Golva—School—Bd. Education receiving bids Mar. 9, Lone Tree School Dist. No. 6. E. E. Egan, Clk. W. D. Gillespie, Fargo, Arch.

Wyo., Powell—Theatre—Verne Steck and others plan.

Mont., Billings—Freight House—Northern Pacific Ry. plans addition, Montana Ave. About $50,000. H. E. Stevens, St. Paul, Ch. Engr.

Mont., Butte—Hospital—Deaconess Hospital plans. C. J. Nepper, Chn. Bd.

Mont., Butte—Hotel—H. E. Andrus receiving bids Feb. 26. About $100,000.

Mont., Glendive—Depot—Northern Pacific Ry. plans. About $80,000. H. E. Stevens, St. Paul, Ch. Engr.

Mont., Roundup—Hotel—Palace Hotel making plans 2-story addition. J. H. Grant, Arch.

Mont., Scobey—Theater—T. M. Facey plans 2-story.

Mo., Kahaka—High School—Bd. Education making plans 3-story. Trunk & Gordon, Donnell Court Bldg., St. Joseph, Arch

Mo., Kansas City—Club House—Kansas City Athletic Club plans 12-story. About $1,000,000.

Mo., Kansas City—Bd. Education plans election to vote on $2,000,000 bonds to improve schools. J. B. Jackson, Jr., Secy.

Mo., St. Louis—G. Golterman, E. Faust and others, forming syndicate to be known as the Thirty-Six Fifty Lindell Realty Corporation to build opera house at 3650 Lindell Blvd.

Ark., Atkins—School—Bd. Education receiving bids Mar. 15, 2-story, brick, 74x158-ft. J. M. Barker, Secy. J. H. Bliss, 607 Southern Trust Bldg., Little Rock, Arch.

Ark., Hot Springs—Hospital—Central Methodist Church plans. About $1,000,000. B. A. Few, Pastor.

Ark., Magnolia—Jail—Columbia County receiving bids Mar. 5. Address County Clk., Magnolia.

Ark., Plainview—School—Bd. Education receiving bids Mar. 14, 2-story, 73x93-ft. W. F. West, Secy. J. H. Bliss, 607 Southern Trust Bldg., Arch.

Ark., Texarkana—City Hall—City plans. About $75,000.

Tex., Austin—Attorney General's Dept. approved $50,000 bond issue to build school in Amarillo Independent School Dist.

Tex., Bryan—Church—Baptist Congregation plans.

Tex., Clarksville—High School—City voted $90,000 bonds to build high school.

Tex., Dallas—School—Bd. Education plans $500,000 bond issue to build schools.

Tex., Dallas—Church—Highland Park Methodist Congregation plans. F. Reedy, Chn. Bldg., Com.

Tex., Dallas—Bank and Office—American Exchange National Bank making plans 16-story, 100x110-ft. About $750,000. E. J. Gannon, Chn. Bldg. Com. Lang & Witchell, Southwestern Life Bldg., Arch.

Tex., Dallas—Business—S. Reinhart plans 2-story, brick. About $50,000.

Tex., Denton—Dormitory—College of Industrial Arts making plans. About $125,000.

Tex., Ft. Worth—Dormitory—Texas Woman's College plans 3-story. About $50,000. J. D. Young, Vice-Pres.

Tex., Ft. Worth—School—School Bd. plans bond issue to build school.

Tex., Galveston—Home—Galveston Nest No. 1726, Order of Owls, plan. About $40,000. A. Lucas, Pres.

Tex., Lubbock—School—City voted $40,000 bonds to build schools.

Tex., Nacogdoches—Court House—Nacogdoches County Comrs. plan 3-story, brick.

Tex., Navasota—Lodge and Business—Masonic Lodges making plans 3-story, brick and concrete. About $100,000.

Tex., Snyder—Business—Robinson & Elkins plan, brick.

Tex., Taylor—Hotel—Murray Hotel soon lets contract. About $75,000.

Tex., Waco—Home—Order of Eastern Star plans. About $75,000.

Tex., Wichita Falls—Library—Library Association plans. Address J. A. Kemp.

Okla., Chickasha—Schools—City plans $85,000 bond issue to build schools.

Okla., Henryetta—School—Bd. Education made plans addition. About $40,000. A. Hefney, Supt. Smith Rea & Lovitt, Okmulgee, 602 Finance Bldg., Kansas City, Mo., Arch.

Okla., Oklahoma—School—City plans election to vote on $650,000 bonds to build schools.

Colo., Salida—Hotel—H. F. Herr made plans on G and 1st St.

Okla., Sapulpa—High School—City plans $150,000 bond issue to build high school. R. E. Jenness, City Clk.

Okla., Spavinaw—Club—Spavinaw Hunting and Fishing Co. plans at mouth of Spavinaw Creek. C. W. Dawson, Muskogee, Arch.

Okla., Tulsa—Business and Office—S. G. Kennedy, M. D., 205 Gallias Bldg., plans 12-story. About $400,000.

Okla., Weatherford—Business—G. K. Harris made plans 2-story, 136x25-ft., brick.

Okla., Woodland—Hall—City soon receives bids 3-story, 68x153-ft. About $50,000. H. H. Alexander, Clk. Hawk & Parr, 501 Security Bldg., Oklahoma, Arch.

Colo., Dolores—High School—City plans bond issue to build high school.

Colo., Gunnison—High School—Bd. Education plans bond issue to build high school. G. Sullivan, Chn. of the Bd.

Idaho, Emmett—Church—Christian Congregation making plans.

Utah, Bingham—Temple—Masons plan.

Utah, Salt Lake City—Terminal—Denver & Rio Grande R.R. plans at Soldier Summit. About $800,000. J. G. Gwyn, Denver, Ch. Engr.

Ariz., Douglas—Schools—City plans $98,000 bond issue to build schools.

Ariz., Phoenix—Store—Boston Store plans. About $60,000.

Ariz., Tucson—Hotel—H. T. Grier and S. Buckingham making plans Geronimo Hotel. About $400,000. J. Parkinson, 420 Title Insurance Bldg., Los Angeles, Arch.

Wash., Spokane—High School—Bd. Education plans addition to North Central High School. About $70,000 or $80,000. C. F. Eikenbary, Pres.

Wash., Spokane—Hotel—H. Goetz plans enlarging Cœur d'Alene Hotel.

Calif., Santa Barbara—Home—C. K. G. Billings plans. About $1,000,000.

Bids In and Contracts Awarded

Mass., Boston—School—Bd. Education let contract 2-story addition to J. J. FLYNN, 27 School St.

N. Y., Syracuse—School—Bd. Education let contract to PHELAN ENGINEERING AND CONSTRUCTION CO., 614 Tully St.

Pa., Bryn Mawr—Hospital—Bryn Mawr Hospital let contract 3-story addition and alterations to J. MEYERS & SON, Witherspoon Bldg., Phila. About $50,000.

Pa., Pittsburgh—Hospital—Passavant Hospital let contract 4-story addition to C. H. KERR CO., 2568 5th Ave. About $120,000.

Pa., Uniontown—Church and Parsonage—St. John the Baptist Greek Congregation let contract 1-story to G. M. HALL CO., Homestead. About $42,000.

Ga., Athens—Georgia State Normal School let contract academic building and dormitory to H. J. CARR & CO., Atlanta. About $70,980.

Miss., Clarksville—Theater—R. N. McWilliams let contract to NICOL, LANGFORD & JOHNSON, Louisville, Ky., $72,000.

Ohio, Akron—Club—University Club let contract to MORAN CO.

Ohio, Cleveland—Auditorium and Lodge—Nobles of Mystic Shrine let contract to JOHN GILL & SONS CO., 1301 Citizens Bldg.

Ohio, Cleveland—Library—Library Bd., 1375 Euclid Ave., received low bid, Jefferson and Tremont St., from Cleveland Fireproof Construction Co., Cleveland.

Ohio, Oxford—Chapel—Western College for Women let contract Kumler Memorial Chapel on campus to T. C. LLOYD, $58,000.

Mich., Hamtramck—(Official)—High School—Bd. Education let contract to MORSWICK BROS., Detroit. About $67,426. Noted Feb. 8.

Ill., Chicago—Hotel—Breakers Hotel let contract 9-story to CALDWELL & MARSHALL, 61 West Randall St. About $650,000.

Wis., Appleton—Asylum—Bd. Supervs. Outagamie County received low bid from Hegner Construction Co., Appleton.

Ia., Cedar Rapids—Dormitory and Hall—Coe College let contract 4-story to LOOMIS BROS., Kimball Bldg. About $90,000.

Ia., Grand Rapids—Store and Office—E. A. Higley let contract 8-story to COLLINS BROS., Kansas City, Mo.

Minn., Okabena—School—Bd. Education, Consolidated School Dist. No. 57, let contract 1-story to MADSEN & PETERSEN, Plymouth Bldg., Minneapolis. About $40,000.

Kan., Wichita—High School—Bd. Education let contract to H. T. ELLIS CONSTRUCTION CO., 1355 North Water St. About $100,000.

Tex., Ft. Worth—Business—H. C. Meacham Co. let contract improving to BRYCE BUILDING CO., Ft. Worth. About $50,000.

Tex., Ft. Worth—E. D. Farmer let contract building to W. H. GILMARTIN, $70,000.

Tex., Ft. Texas—Jail—Tarrant County let contract 6-story to TAYLOR BUILDING CO. About $264,914.

Tex., Waco—Business—Sanger Bros. let contract 3-story to H. GROSS. About $150,000.

Tex., Waxahachie—High School—Bd. Education let contract to CADDO CONSTRUCTION CO., Dallas.

Okla., Comanche—Business—Higginbotham Bros. let contract 3-story to OATES & SULLIVAN.

Water Consumption at the Government Printing Office, Washington, D. C., averaged 3,382,000 gal. per day in 1916, compared with 2,585,000 the previous year. The reason for this large consumption, according to C. A. F. Flagler, Lieutenant-Colonel, Corps of Engineers, U. S. A., in charge of the Washington Aqueduct and Filtration Plant, is that the engines at the Government Printing Office use filtered water for condensing purposes. If the Printing Office were supplied with power from the new central power plant or from the Capitol power plant, each of which uses river water for condensing, or if a system of cooling towers was installed in the Printing Office Building, the consumption might be reduced to a maximum of about 550,000 gal. per day. The cost of the water saved at 2.45c. per 1000 gal. would be $18,248 per year and in addition the District of Columbia would be saved a large expense for pumping condensing water through the sewers.

A State Building Code for Massachusetts was framed by a commisison appointed in 1913 and is in the hands of a special committee of the legislature of 1916. This committee has held many public hearings on the code and will report it for action to the legislature of this year. The code creates a state building commissioner who issues general regulations covering the use of materials, etc., which regulations are uniform for the entire state. The commissioner also has authority to enforce these regulations and to supervise the construction of buildings of importance in all parts of the state, except in cities having a recognized department of buildings. In such cities the enforcement of the law will lie with the building department. These local building departments can also make additional and more stringent requirements than those framed by the state building commissioner, but are not permitted to make them less severe

SEWER, PORTLAND, ORE.

Bids were received by city, Jan. 17, for Tanner Creek Sewer from (A) F. SHEA & W. LIND (awarded contract); (B) Jacobsen-Jensen Co.; (C) Liebisch & Joplin, $309,174. The item bids were as follows:

	A	B	C
1,125 lin.ft. reinforced concrete sewer 6 ft. 6 in. x 9 ft. 11 in.	$21.00	$22.00	$23.80
1,002 lin.ft. reinforced concrete sewer, 6 ft. 6 in. x 9 ft. 5 in.	20.00	20.00	22.50
783 lin.ft. reinforced concrete sewer, 6 ft. 6 in. x 8 ft. 11 in.	19.10	19.00	21.00
510 lin.ft. reinforced concrete sewer, 6 ft. 6 in. x 8 ft. 5 in.	18.25	18.00	20.00
312 lin. ft. reinforced concrete sewer, 6 ft. 6 in. x 8 ft. 5 in. reduced to 6 ft. 6 in. x 6 ft. 8 in.	18.20	17.50	19.25
8 lin.ft. reinforced concrete sewer, 6 ft. 6 in. x 6 ft. 8 in. reduced to 6 ft. 0 in. x 6 ft. 8 in.	18.50	16.50	25.00
670 lin.ft. reinforced concrete sewer, 6 ft. 0 in. x 6 ft. 8 in., Type "A"	13.40	8.50	14.25
670 lin.ft. reinforced concrete sewer, 6 ft. 0 in. x 6 ft. 8 in., Type "B"	14.30	9.00	14.75
38 lin.ft. reinforced concrete sewer, 6 ft. 0 in. Circular	14.10	11.00	15.00
1,736 lin.ft. concrete sewer tunnel section, 4 ft. x 4 ft. 8 in.	11.30	8.50	9.80
670 lin.ft. concrete sewer, 3 ft. 0 in. x 4 ft. 7 in. reinforced, 54 in. x 81 in. egg-shaped	9.35	8.00	12.80
60 lin.ft. concrete sewer 4 ft. 4 in. x 4 ft. 2½ in., reinforced, 72x66 in. catenary	8.05	8.00	13.00
290 lin.ft. steel rib reinforcement in 6 ft. circular sewer	16.00	20.00	17.80
302 lin.ft. concrete sewer, 30 in. diameter	4.55	4.75	3.70
200 lin.ft. 10 in. 2nd grade sewer pipe with gravel, as per plan	.70	.50	.52
5,000 lin.ft. 8 in. 2nd grade sewer pipe with gravel, as per plan	.50	.35	.40
200 lin ft. 6 in. 2nd grade sewer pipe with gravel, as per plan	.40	.25	.30
988 lin.ft. 24 in. vitrified sewer pipe in concrete, as per plan	3.60	2.60	3.50
254 lin.ft. 24 in. vitrified sewer pipe	2.00	2.60	2.00
132 lin.ft. 18 in. vitrified sewer pipe	1.40	1.80	1.20
278 lin.ft. 14 in. vitrified sewer pipe	1.00	1.30	.80
108 lin.ft. 12 in. vitrified sewer pipe	.72	1.00	.60
236 lin.ft. 10 in. vitrified sewer pipe	.59	.60	.50
1,000 lin.ft. 8 in. vitrified sewer pipe	.43	.40	.35
310 lin.ft. 6 in. vitrified sewer pipe	.30	.25	.25
32 Y branches, 24x8 in. vitrified sewer pipe in concrete	10.80	8.00	11.00
8 Y branches, 24x8-in. vitrified sewer pipe	7.50	8.00	7.60
4 Y branches, 18x8-in. vitrified sewer pipe	5.10	5.50	4.75
8 Y branches, 14x8-in. vitrified sewer pipe	3.90	4.00	3.00
1 Y branch, 12x8-in. vitrified sewer pipe	3.10	3.50	2.25
8 Y branches, 10x8-in. vitrified sewer pipe	2.10	3.00	1.85
4 Y branches, 8x8-in. vitrified sewer pipe	1.60	1.00	1.40
10 one-eighth bends, 8-in. diameter vitrified sewer pipe	1.25	1.00	1.10
39 concrete manholes complete	90.00	60.00	60.00
12 concrete inlets complete	27.00	15.00	15.00
1 concrete stilling well, complete	200.00	80.00	90.00
1 complete connection with 6-ft. sewer, at 13th and Davis Sts.	100.00	250.00	300.00
1 complete connection with 6-ft. sewer, at 14th and Couch Sts.	100.00	250.00	300.00
1 complete connection with 6-ft. sewer, at 15th and Burnside	100.00	250.00	250.00
1 complete connection with 6-ft. sewer, at 17th St.	100.00	250.00	300.00
1,736 lin.ft. tunnel exc. and timbering with conc. backfill, 4 ft. x 4 ft. 8 in. sewer	14.00	20.00	11.20
45,500 cu.yds. excavation and refilling	2.00	2.08	2.00
100 cu.yds. extra concrete 1:2½:3½ mixture	8.00	8.00	8.00
100 cu.yds. extra concrete 1:2½:5 mixture	7.50	7.50	7.50
1,000 extra vitrified blocks in place, each	.05	.06	.05
1,000 lb. extra steel for reinforcement in place, per lb.	.05	.06	.065
1,100 M ft. BM lumber in place, Class "A," per M ft. B.M.	9.00	11.00	11.00
10 M ft. BM lumber in place, Class "B," per M ft. B.M.	12.00	25.00	20.00
500 cu.yd. crushed rock or gravel, in place	2.50	2.00	1.50
860 sq yd. asphalt pavement to be taken up and relaid	3.50	3.50	3.60
1,650 sq.yd. bitulithic pavement to be taken up and relaid	3.50	3.50	3.60
870 sq.yd. stone block pavement to be taken up and relaid	3.00	3.00	2.50
40 sq.ft. concrete sidewalk to be taken up and relaid	.12	.20	.15
40 lin.ft. concrete curb to be taken up and relaid	.50	.50	.40
1 reinforced concrete diversion chamber on 17th St.	450.00	700.00	500.00
1 reinforced concrete junction chamber at 15th and Burnside	400.00	600.00	500.00
40,000 lin.ft. piling driven in place, per ft.	.30	.25	.36
20 lin.ft. 6-in. extra heavy cast iron soil pipe, laid	.60	2.00	2.25
30 lin.ft. 8-in. extra heavy cast iron soil pipe, laid	.80	2.50	3.00
Changing house connections from old to new sewer as follows:			
No. 129 11th St. N. to curb line in 11th St. N.	75.00	100.00	40.00
No. 127 11th St. N. to curb line in 11th St. N.			
No. 441 Glisan St. to curb line in 11th St. N.	300.00	400.00	320.00
No. 443 Glisan St. to curb line in 11th St. N.			
No. 445 Glisan St. to curb line in 11th St. N.			
No. 448 and 454 Glisan St. to curb line in Glisan St.	150.00	200.00	90.00
No. 106 and 108 12th St. N. to curb line in Flanders St.	150.00	200.00	80.00
No. 101, 103 and 105 11th St. N. to curb line in Flanders St.	225.00	300.00	130.00
No. 34 15th St. N. to curb line in Couch St.	75.00	100.00	40.00
Nos. 29 and 31 14th St. N. to curb line in 14th St. N.	150.00	200.00	150.00
No. 25 14th St. N. to curb line in 14th St. N.	75.00	100.00	85.00
No. 501 Burnside St. to curb line in 14th St. N.	75.00	100.00	75.00
No. 505 Burnside St. and Nos. 20 and 26 15th St. to curb line in Burnside St.	225.00	300.00	120.00
4,580 cu.yd. filling to be placed in abandoned sewer	2.20	2.00	2.00
220 cu.yd. debris to be removed from old sewer	2.50	3.00	3.50
Extended totals	$302,801	$303,921	$309,174

VIADUCT, KANSAS CITY, MO.

Bids were received by Board of Public Works, Jan. 23, for viaduct on 27th St. from (A) McMILLAN CONTRACTING CO., Old Colony Bldg., Chicago (awarded contract); (B) Kansas Paving and Construction Co.; (C) Blodgett Construction Co.; (D) Fox-Redpath Construction Co., $92,861; (E) Eberhardt Construction Co., $94,271; (F) Concrete Construction Co., $94,387; (G) O'Hagan & Clark Construction Co., $94,530; (H) List & Gifford Construction Co., $101,806; (I) Missouri Valley Bridge and Iron Co., $104,751; Midland Bridge Co., $116,406. The item bids of the 3 lowest bidders were as follows:

	A	B	C
318 cu.yd. concrete in arch ribs between faces of arch abutment walls	$14.10	$12.00	$11.70
332 cu.yd. concrete in floor system and spandrel walls on arch span	12.82	10.00	11.40
752 cu.yd. concrete in east and west arch abutments below elevation, 15,800	7.70	9.00	7.50
594 cu.yd. all other concrete in east and west arch abutments, except lamp-posts	10.59	11.00	9.00
226 cu.yd. concrete in column pedestals and in columns below main girders	9.22	9.00	12.60
1,171 cu.yd. all other concrete in girder spans	10.32	10.00	10.50
374 cu.yd. concrete in piers under end abutments and retaining walls	8.64	9.00	7.20
881 cu.yd. all other concrete in end abutments and retaining walls	10.00	9.00	9.90
1,085 lin.ft. concrete railings and small railing posts, including reinforcing steel	3.00	1.75	3.60
12 lamp-posts	40.00	25.00	*
205,000 lb. reinforcing bars ¾ in. and over	.045	.05	.054
165,000 lb. reinforcing bars less than ¾ in., except in railings	.046	.05	.055
3,600 lb. lead plates	.10	.12	.12
1,000 copper plates	.45	.60	.65
3 bronze name plates	30.00	150.00	75.00
40,000 lb. all other metal, except that in electric lighting system	.06	.10	.063
470 cu.yd. crushed limestone for ballast on main viaduct and for drains in fills in both approaches	2.30	2.00	2.70
2,000 sq.yd. creosoted wood block pavement, including concrete base, on main viaduct and E. approach	3.25	2.60	3.30
450 sq yd. bituminous macadam pavement on west approach	1.50	1.33	1.50
450 lin.ft. concrete curbs and gutters, both approaches	.80	.75	.44
1,276 sq.ft. concrete sidewalks, east approach	.14	.15	.17
1,190 sq.ft. binder sidewalks, west approach	.08	.07	.12
1,115 cu.yd. sand fill, east approach	1.60	1.50	1.75
1,870 cu.yd. earth fill, west approach	.50	.40	.30
3,126 cu.yd. earth excavation	1.00	2.00	.75
56 cu.yd. shale excavation	1.00	3.00	1.80
113 cu.yd. limestone rock excavation	2.50	4.00	4.50
14,060 sq.ft. waterproofing on main viaduct	.08	.05	.10
Electric lighting system (lump sum)	1,976.29	2,000.00	2,000.00
158 lin.ft. 12-in. vitrified clay sewer pipe	.60	.50	.45
160 lin.ft. 18-in. vitrified clay sewer pipe	1.04	.90	.85
6 manholes, style "C-1"	65.00	50.00	13.50
365 cu.yd. sewer excavation	1.25	1.00	.85
1 catch basin, style "F," with street inlet drop	35.00	40.00	22.00
Cleaning up and removal of debris (lump sum)	250.00	200.00	500.00
Finishing ground surface (lump sum)	75.00	100.00	300.00
Extended totals	$90,523	$92,232	$92,321

BARGE CANAL, ALBANY, N. Y.

Contract No. 141

Bids were received by W. W. Wotherspoon, State Supt. Pub. Wks., Feb. 20, for Barge Canal Work, Contract No. 141, improving Erie, Oswego and Champlain Canals, from (A) W. T. Maas & Son, 124 Railroad St., Rochester; (B) Scott Bros., Rome; (C) J. L. Richmond, Ridgefield Springs; (D) Lupfer & Remick, 594 Ellicott Sq., Buffalo, $48,588. The item bids of the 3 lowest bidders were as follows:

	A	B	C
4,600 cu.yd. excavation	$0.45	$0.60	$0.50
26 M.F.B.M. sheeting and bracing	55.00	50.00	60.00
3,500 cu.yd. embankment	.15	.15	.15
5 cu.yd. lining	1.50	1.50	2.00
2,870 lin.ft. foundation piles	.40	.40	.50
2,980 sq.ft. steel sheet piling	1.80	1.75	2.00
2,100 cu.yd. second-class concrete	8.50	9.00	9.00
195 cu.yd. first-class reinforced concrete	22.00	30.00	20.00
18,500 lb. structural steel	.07	.07	.08
11,400 lb. metal bar reinforcement	.05	.045	.07
5,450 lb. wire mesh reinforcement	.10	.10	.11
1,950 lb. conductors	.42	.36	.35
1,050 lb. metal duct	.16½	.15	.14
150 lin.ft. fiber duct	.24	.20	.20
210 sq.yd. painting concrete	.20	.20	.20
1 wrecking substructure and superstructure of power house (lump sum)	2,000.00	2,200.00	2,500.00
1 installing power station equipment now on site of contract (lump sum)	840.00	700.00	700.00
800 lb. furnishing and installing missing or broken equipment	.18	.15	.20
1 electrical connection (lump sum)	180.00	150.00	150.00
14 tile roofing—removed and relaid (per sq.)	18.00	15.00	10.00
5 tile roofing—furnished and laid (per sq.)	60.00	50.00	60.00
1 concrete pole—complete (lump sum)	100.00	100.00	100.00
1 coffer-dams pumping, bailing and draining (lump sum)	1,200.00	1,200.00	2,500.00
Extended totals	$41,181	$43,920	$44,919

SEWER, MILWAUKEE, WIS.

Bids were received by Sewerage Commission Feb. 1 for sewer in portion 40th St. from (A) O. H. Bossert, Milwaukee; (B) Underground Construction Co., Chicago; (C) Wisconsin Tunnel and Construction Co., Milwaukee; H. Hohensee, Milwaukee, $39,896; O'Brien Construction Co., Chicago, $45,736; J. F. Casey Co., Pittsburgh, $46,926. The item bids of the 3 lowest bidders were as follows:

	A	B	C
1,375 lin.ft. 54 in. concrete sewer in tunnel	$19.70	$22.15	$25.00
151 ft. standard manholes	7.00	18.00	10.00
4 cast iron manhole frames and covers	40.00	16.00	20.00
Extended totals	$28,305	$33,238	$35,965

BUILDING OPERATIONS FOR JANUARY

The following is a list of contracts awarded, published by the F. W. Dodge Co., throughout the States of New England, New York, New Jersey, Pennsylvania, Maryland, and Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, North and South Dakota, and portions of Missouri and eastern Kansas:

Contracts awarded month of January, 1917	$90,849,000
Contracts awarded month of January, 1916	62,784,500
Contracts awarded month of January, 1915	43,257,000
Contracts awarded month of January, 1914	51,102,000
Contracts awarded month of January, 1913	62,810,500
Contracts awarded month of January, 1912	38,910,000
Contracts awarded month of January, 1911	66,892,000
Contracts awarded month of January, 1910	39,005,395

In New York and northern New Jersey:

Contracts awarded month of January, 1917	$21,858,000
Contracts awarded month of January, 1916	9,227,500
Contracts awarded month of January, 1915	9,940,500
Contracts awarded month of January, 1914	8,111,000
Contracts awarded month of January, 1913	22,481,500
Contracts awarded month of January, 1912	10,075,000
Contracts awarded month of January, 1911	15,499,000
Contracts awarded month of January, 1910	11,193,500

These figures show that in the entire territory this is the largest year of contracts awarded on record, in the smaller territory 1913 being the only year in which more work was let, the total amount being about $600,000 in excess of January of this year. These figures are against contracts awarded in the larger territory of $112,991,000 in December and $122,000,000 in November, and in the smaller territory of $28,278,000 for December and $30,000,000 for November.

It must be taken into consideration, however, that January is one of the worst building months in the year, and the dropping off in work is not in proportion of what it has been in years past.

SEWER, HOUSTON, TEX.

Bids were received by city Jan. 29 for sanitary sewer on portion of Sherman St. from (A) HOUSTON CONSTRUCTION CO. (awarded contract); (B) Horton & Horton; (C) Freund & Quay. The item bids were as follows:

	A	B	C
100 cu.yd. extra excavation	$1.00	$1.50	$1.00
100 ton mile hauling	.75	.30	.75
500 man hr. extra work, labor	.30	.30	.30
200 team hr. extra work, teams	.60	.70	.80
10 M ft. timber in foundations	20.00	25.00	25.00
350 M ft. timber ordered left in trenches	14.00	17.00	16.00
5 cu.yd. extra class I concrete	10.00	12.00	10.00
5 cu.yd. extra class II concrete	10.00	15.00	12.00
5 cu.yd. extra class III concrete	12.00	17.00	15.00
5 cu.yd. extra brick masonry	20.00	25.00	20.00
1,000 lb. extra castings	.05	.08	.06
1,000 lb. extra reinforcing steel	.07	.10	.10
300 cu.yd. road gravel	2.50	2.25	2.00
300 cu.yd. road shell	2.50	2.00	2.50
9 standard sanitary sewer manhole	45.00	60.00	50.00
20 lin.ft. extra depth sanitary sewer manhole	6.00	6.00	6.00
18 standard drop manhole	55.00	65.00	60.00
190 lin.ft. extra depth drop manhole	7.00	8.00	7.00
Standard flush tank type A			
Standard flush tank type B			
100 lin.ft. 12 in. vit. pipe sewer 0–6 ft.	1.00	1.20	.95
420 lin.ft. 12 in. vit. pipe sewer 6–8 ft.	1.10	1.35	1.00
1,640 lin.ft. 12 in. vit. pipe sewer 8–10 ft.	1.40	1.50	1.50
800 lin.ft. 12 in. vit. pipe sewer 10–12 ft.	1.70	1.90	1.60
120 lin.ft. 12 in. vit. pipe sewer 12–14 ft.	2.10	2.20	2.10
100 lin.ft. 15 in. vit. pipe sewer 10–12 ft.	2.10	2.30	2.10
660 lin.ft. 15 in. vit. pipe sewer 12–14 ft.	2.25	2.45	2.30
1,380 lin.ft. 15 in. vit. pipe sewer 14–16 ft.	2.50	3.85	2.60
1,000 lin.ft. 15 in. vit. pipe sewer 16–18 ft.	4.90	4.20	6.00
900 lin.ft. 15 in. vit. pipe sewer 18–20 ft.	6.90	5.60	7.10
700 lin.ft. 15 in. vit. pipe sewer 20–22 ft.	8.60	6.50	8.50
100 lin.ft. 15 in. vit. pipe sewer 22–24 ft.	9.00	7.00	8.50
500 lin.ft. 6 in. stacks deep connections	1.40	2.00	1.50
8 8-in. Ys shallow connections	3.00	6.00	12.40
10 8-in. jt. of pipe in manhole	2.00	1.00	2.00
6 12-in. jt. of pipe in manhole	3.00	1.50	2.00
2 15-in. jt. of pipe in manhole	4.00	3.00	3.00
Extended totals	$38,685	$39,474	$40,930

SEWER, HOUSTON, TEX.

Bids were received by city Jan. 29 for sanitary sewer on portion of Center St. from (A) F. C. YOUMANS CONSTRUCTION CO. (awarded contract); (B) Houston Construction Co.; (C) H. M. Truehart. The item bids were as follows:

	A	B	C
10 cu.yd. extra excavation	$1.00	$1.00	$1.00
50 ton mile hauling	.40	.75	.60
500 man hr. labor	.30	.30	.35
50 team hr. teams	.70	.60	.75
1 M ft. timber in foundations	25.00	25.00	35.00
325 M ft. timber ordered left in trenches	12.00	14.00	14.00
2 cu.yd. extra class I concrete	10.00	10.00	10.00
2 cu.yd. extra class II concrete	11.00	12.00	11.00
2 cu.yd. extra class III concrete	12.00	14.00	12.00
2 cu.yd. extra brick masonry	12.50	20.00	14.00
1,000 lb. extra castings	.05	.06	.05
1,000 lb. extra reinforcing steel	.05	.10	.05
300 cu.yd. road gravel	2.25	3.00	2.50
200 cu.yd. road shell	1.90	3.00	2.25
20 standard sanitary sewer manhole	45.00	45.00	50.00
230 lin.ft. extra depth sanitary sewer manhole	6.00	5.00	6.00
5 standard drop manhole	70.00	50.00	65.00
20 lin.ft. extra depth drop manhole	8.00	6.00	6.50
Standard flush tank type "A"			
Standard flush tank type "B"			
1,400 lin.ft. 15 in. std. vit. pipe sewer 0–6 ft. deep	1.20	1.30	1.25
600 lin.ft. 15 in. std. vit. pipe sewer 6–8 ft. deep	1.30	1.30	1.40
3,000 lin.ft. 15 in. std. vit. pipe sewer 8–10 ft. deep	1.50	1.50	1.60
1,500 lin.ft. 15 in. std. vit. pipe sewer 10–12 ft. deep	1.70	1.80	1.85
2,200 lin.ft. 15 in. std. vit. pipe sewer 12–14 ft. deep	1.90	2.20	2.25
2,200 lin.ft. 15 in. std. vit. pipe sewer 14–16 ft. deep	2.20	2.40	2.50
500 lin.ft. 15 in. std. vit. pipe sewer 16–18 ft. deep	2.30	2.50	2.75
20 15x8 in. Ys, shallow connections	4.00	4.00	2.50
350 lin.ft. 6 in. stacks, deep connections	1.00	1.00	1.50
20 8 in. pipe in manhole, 1 joint	1.00	2.00	1.25
Extended totals	$28,306	$30,935	$31,657

SEWER, KANSAS CITY, MO.

Bids were received by the Board of Public Works for sewers in Sewer Dist. No 348, Division No. 4, from (A) HALPIN-BOYLE CONSTRUCTION CO. (awarded contract); (B) M. Walsh; (C) J. R. Oldham Construction Co.; (D) W. C. Mullins, $85,943; (E) Brown Bros., $87,371; (F) Johnson Construction Co., $100,130. The item bids of the 3 lowest bidders were as follows:

	A	B	C
12,190 lin.ft. 10-in. vitrified clay pipe	$2.05	$2.00	$1.90
1,790 lin.ft. 12-in. vitrified clay pipe	2.00	2.10	2.00
3,590 lin.ft. 15-in. vitrified clay pipe	2.00	2.35	2.00
1,310 lin.ft. 18-in. vitrified clay pipe	2.25	2.75	2.40
890 lin.ft. 21-in. vitrified clay pipe	2.50	3.40	3.25
310 lin.ft. 24-in. vitrified clay pipe	2.75	4.00	3.50
1,210 lin.ft. 27-in. vitrified clay pipe	3.00	4.40	4.15
970 lin.ft. 33-in. monolithic concrete sewer	3.00	4.00	4.50
450 lin.ft. 39-in. monolithic concrete sewer	4.00	4.70	5.75
110 lin.ft. 42-in. monolithic concrete sewer	5.00	4.75	6.50
970 lin.ft. 33-in. segment block sewer	.....	.....	.....
450 lin.ft. 39-in. segment block sewer	.....	.....	.....
110 lin.ft. 32-in. segment block sewer	.....	.....	.....
960 lin.ft. 48-in. segment block sewer	.....	.....	.....
960 lin.ft. 48-in. monolithic concrete sewer	6.00	5.25	7.25
910 lin.ft. 54-in. segment block sewer	.....	.....	.....
910 lin.ft. 54-in. monolithic concrete sewer	6.50	5.25	8.30
94 lin.ft. 66-in. special section	7.00	7.00	11.00
2,640 lin.ft. 12-in. catch basin connections, vitrified	1.00	.90	1.40
2,640 lin.ft. 12-in. catch basin connections, plain	.....	.....	.....
70 lin.ft. 15-in. catch basin connections, vitrified	1.25	1.00	1.50
78 cu.yd. rubble masonry	6.00	6.00	6.00
94 catch basins, style "F," with street inlet drops	40.00	40.00	40.00
116 manholes, style "C-1"	75.00	50.00	62.00
1 drop manhole, style "C-1"	100.00	70.00	75.00
8 interceptor	100.00	90.00	100.00
Extended totals	$78,853	$78,895	$84,675

SEWER, MILWAUKEE, WIS.

Kinnickinnic River Valley Sewer

Bids were received by Sewerage Commission Feb. 1 for Kinnickinnic River Valley Sewer, Section No. 2, from (A) J. A. Green & Co., Chicago; (B) Wisconsin Tunnel and Construction Co., Milwaukee; (C) J. Ferry & Sons, Atlantic City, N. J.; J. F. Casey Co., Pittsburgh, $443,445. The item bids of the 3 lowest bidders were as follows:

	A	B	C
1 30-in. cast iron inverted siphon (lump sum)	$32,510.50	$35,000.00	$55,000.00
1,536 lin.ft. 60 in. concrete sewer	33.30	26.25	38.00
6,436 lin.ft. 48 in. concrete sewer	20.00	23.75	28.25
5,598 lin.ft. 42 in. concrete sewer	19.50	22.50	15.00
78 lin.ft. 36 in. concrete sewer	37.70	25.00	31.00
2,729 lin.ft. 18 in. terra cotta and concrete sewer	14.30	12.00	12.00
633 lin.ft. 12 in. terra cotta and concrete sewer	13.00	12.00	8.50
690 ft. standard manholes	18.00	10.00	8.00
100 ft. drop manholes	20.00	20.00	10.00
41 cast iron manhole frames and covers	15.00	20.00	15.00
Extended total	$386,770.00	$406,144.00	$426,837.00

H. S. Kerbaugh, Inc., Contractors, have removed their offices to 1042 Marine National Bank Bldg., Buffalo, N. Y.

The Osborn Engineering Co. will remove its offices from the Engineers Bldg., Cleveland, Ohio, to 2848 Prospect Ave., Cleveland.

The Stroh-Steel Hardening Process Co., Pittsburgh, Penn., has opened an office at 728 Monadnock Blk., Chicago, Ill., in charge of F. Lloyd Mark, Western Sales Mgr.

W. A. Zeinicker Supply Co., St. Louis, Mo., has purchased the abandoned lines of the Idaho Southern R.R. running from Fooding to Jerome, Idaho, and the Milner & North Side R.R. running from Milner to Oakley, Idaho, about 50 mi. The new owners will dismantle the roads and sell the rails and other equipment.

Explosions of Electrolytic Oxygen have increased to such an extent that an investigation has been instituted by the United States Bureau of Mines. The first of these explosions occurred in Cincinnati. The coroner's jury call attention to the fact that there were no specifications for the purity of oxygen and recommended to Col. B. W. Dunn, of the Bureau of Explosives, that an investigation be made of the electrolytic process of making oxygen. The bureau, not having facilities for making such tests, referred the inquiry to the Bureau of Mines, which will shortly issue a report. Answering a recent query, George F. Wright, Chief Mining Engineer of the bureau, gave some of the preliminary findings, as follows:

Strictly speaking, there is no spontaneous combustion; in all cases where sufficient data have been obtained, the oxygen has been used in conjunction with a torch for welding or cutting, and the flame has flashed back through the mixture. It is possible that ignition may occur by a jet of oxygen playing on a carbonaceous material under certain special conditions; nevertheless, these conditions are most unusual, as in many experimental tests made by the bureau the jet could not be so arranged as to cause ignition, although there was a rise of temperature at a certain point and cooling due to expansion at a point beyond. In all cases the real danger is in the hydrogen getting into the oxygen, and it has been found that this is due to improper design in the manufacturing apparatus; to insufficient safeguards connected with the electric apparatus, the polarity suddenly and unexpectedly shifting; to the manufacture of oxygen without frequent analyses; and to incompetent or ignorant attendants. Unfortunately, certain makers of oxygen-manufacturing apparatus have advertised that any laborer can take care of their apparatus. It is believed tht the manufacture of electrolytic oxygen can be carried on in a manner to make it entirely safe. In fact, there must be over 9% of hydrogen with the oxygen to form an explosive mixture. Certain tanks from one batch caused three widely separated explosions in California, killing seven men in all, and an analysis of gas from a tank filled at the same time showed that it contained over 50% hydrogen.

Record Minerals Production in United States in 1916—Coal production in the United States aggregated 597,500,000 tons in 1916, with 570,000,000 tons in 1913, the previous high year. More than 35,000,000 tons of beehive coke was manufactured—an increase of over 27% compared with 1915, and 500,000 tons more than the record-breaking total in 1910. Byproduct coke amounted to 19,200,000 tons, which was 5,000,000 tons greater than in 1915. The copper output was nearly two billion pounds. The marketed production of crude petroleum was 292,000,000 bbl., 11,000,000 more than in 1915. Shipments of portland cement approximated 94,500,000 bbl., an increase of 7,500,000 over 1915. Production did not keep pace with shipments, but it did amount to 91,194,000 bbl., an increase of more than 5,000,000 bbl. over 1915. Secretary Lane, of the Department of the Interior, in commenting upon the report of the Geological Survey said: "Never before has so large a draft been made on the natural resources of our country as during this year, and never before have the metals been extracted with less waste or utilized to better advantage in advancing the general prosperity of the country."

Fire Protection of Celluloid—The combustibility of pyroxylin plastics, commonly known as celluloid, and their protection against fire have been investigated by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies, 31 Milk St., Boston, Mass., and a pamphlet has been issued on the subject. The conclusions are that celluloid fires are gas fires and must be so considered in designing fire cutoffs and protecting against celluloid exposure. Sprinklers can extinguish fires in celluloid, if sufficient water is available at once. Decomposition of celluloid is liable under certain conditions at temperatures between 200 and 300° F., liberating considerable heat and rapidly forming large volumes of explosive and poisonous gases. These rapidly formed gases can exert great pressure in addition to their ability to explode when mixed with air, and this pressure is the cause of much of the destruction noticed in fires in large quantities of celluloid. Its protection in large quantities can be facilitated by the use of heat-insulating containers, which will reduce the velocity of progress of the fire and give more time for the sprinklers to open. The pamphlet is the work of F. J. Hoxie and John R. Freeman.

A Foreign-Trade Employment Exchange will be started by the Bureau of Foreign and Domestic Commerce, United States Department of Commerce, on July 1, according to an announcement by Dr. Edward E. Pratt, Chief of the Bureau, in an address before the Fourth National Foreign Trade Convention at Pittsburgh, Penn., Jan. 25. Dr. Pratt said: "Qualified men for foreign trade are badly needed, and many of our manufacturers and exporters feel that they have not adequate facilities for getting in touch with available men. The Bureau's exchange will be conducted in this way: We shall permit any properly qualified man to register a full statement of his qualifications, with references, etc. We shall then insert a blind notice in Commerce Reports on two occasions. The statement of qualifications will also be filed, and will be referred to when vacant jobs are called to our attention. Any manufacturer or exporter who wants a man may write us and obtain a list of eligibles who seem to have the qualifications desired. Any employer may have inserted in Commerce Reports on two occasions a blind notice stating the qualifications of a man he desires to secure. We expect to make the machinery simple and the conditions for registration severe. Our hope is to facilitate the process of getting trained men. Our objects may be summarized as follows: To get in touch with the best men for our own positions; to do something for men who are obviously well qualified, but are unemployed; to enable us to answer intelligently the numerous inquiries which we receive from employers."

The American Potash Output is growing rapidly, according to a recent report of the United States Geological Survey, which also expresses the opinion that the output for 1917 will exceed even that of the unusual year just closed. The total production of potash salt and potash products in the United States in 1916 represented about 10,000 tons of K_2O, having a net value at point of shipment of at least $3,500,000. This is ten times the value in 1915. The production may be summarized as follows: Mineral sources, natural salt or brine, 3850 short tons; alunite and silicate rock, including furnace dust recoveries, 1900; total mineral, 5750; organic sources—kelp, 1110; pearlash (mostly from hardwood ashes), reports of 22 producers out of 70 announce 220 tons; miscellaneous industrial wastes, 1750; total organic, 3080 tons. The largest output was from the Nebraska alkali lakes.

Contracts To Be Let

Bids received until Mar. 21, 1917.

Wate.works Improvements

Lawrence, Kan.

Sealed bids will be received by F. D. Brooks, City Clerk of Lawrence, Kansas, at his office, up to 10 A.M., March 21, 1917, for improvements to water-works plant. List of contracts on which bids are to be received is given below. All material to be furnished and all construction is to be in accordance with the Plans, Profiles and Specifications on file in the City Clerk's office:

Stack
Valves and Hydrants
Steam Pumping Engines
Boiler and Boiler-Room Equipment
Filter and Softening Equipment
Cast-Iron Pipe
Centrifugal Pump
General Contract

When filed with the City Clerk each bid shall be accompanied by a certified check on a local bank or a cashier's check on any bank in the amount of 7 per cent. of the bid as evidence of good faith on the part of the bidder. The checks will be returned to the unsuccessful bidders at the time their bids are rejected.

The City Commission reserves the right to reject any and all bids. Specifications and forms on which all bidders will be required to submit their bids may be obtained from the City Clerk or the Engineers, Black & Veatch, Interstate Building, Kansas City, Missouri. Plans may be examined free of charge, either at the office of the City Clerk or the Engineers. Complete sets of plans may be obtained from the Engineers by making a deposit of Fifty ($50.00) Dollars, which deposit will be returned to unsuccessful bidders only on return of the plans within ten days from the day on which bids are received.

The following is the approximate list of quantities in each Contract:

Stack 54"x100'

Valves and Hydrants
- 10—4" Hub End Double Gate Valves and Boxes
- 5—6" Hub End Double Gate Valves and Boxes
- 6—8" Hub End Double Gate Valves and Boxes
- 2—10" Hub End Double Gate Valves and Boxes
- 4—12" Hub End Double Gate Valves and Boxes
- 7—14" Hub End Double Gate Valves and Boxes
- 1—12" Flanged D.G. Valve with 2' 0" Extension Stem and Handwheel
- 3—20" Flanged D.G. Valve with Handwheel.
- 25—8" Quick Opening Flanged Single Gate Valves with lever attached
- 8—16" Square Sluice Gates and Floor Stands
- 5—20" Square Sluice Gates and Floor Stands
- 1—16" Hydraulic Valve

Steam Pumping Engine
- 1—3,000,000 Gallon Crank and Flywheel Corliss Pumping Engine
- 1—1,000,000 Gallon Myer Gear Crank and Flywheel Pumping Engine

Boiler and Boiler-Room Equipment
- 1—150-hp. Return Tubular Boiler and Boiler-Room Equipment

Equipment for 3,000,000 Gallon Rapid Sand Filter Plant

Cast-Iron Pipe
- 180'—4" Hub End Class B Cast-Iron Pipe
- 240'—6" Hub End Class B Cast-Iron Pipe
- 390'—8" Hub End Class B Cast-Iron Pipe
- 4800'—8" Hub End Class C Cast-Iron Pipe
- 1690'—10" Hub End Class B Cast-Iron Pipe
- 4390'—12" Hub End Class B Cast-Iron Pipe
- 6815'—14" Hub End Class B Cast-Iron Pipe
- 430'—16" Hub End Class B Cast-Iron Pipe
- 35,000 lb. of Standard Hub End Castings
- 30,000 lb. of Standard Flanged Castings
- 15,000 lb. of Standard Flanged Pipe

4—500 Gallons per minute Motor-Driven Centrifugal Pumps

General Contract
- Laying 18,935 lin.ft. of Cast-Iron Pipe 4"-16" in size
- Building Filter and Pump House and Coal Bunkers
- Furnishing and erecting Aërator
- Furnishing material and placing 2094 cu.yd. of Reinforcing Concrete
- 274 cu.yd. of Plain Concrete
- 8.5 cu.yd. of Concrete in Chemical Tanks
- 14,000 cu.yd. of Excavation
- 550 lin.ft. Sewer 8" to 18" in size
- 165 cu.yd. Concrete in Machinery Foundations
- 15 cu.yd. Concrete in Pipe Gutters
- 11,200 lb. Cast-Iron Pipe Gutter Plates
- Raising top of Three Curb Wells

W. J. FRANCISCO, Mayor.
F. D. BROOKS, City Clerk.
BLACK & VEATCH, Engineers,
Interstate Building,
Kansas City, Missouri.

SPECIAL OPPORTUNITIES SECTION

Contracts To Be Let

Bids received until Apr. 2, 1917.

Permanent Road Construction

FAYETTE COUNTY, WEST VIRGINIA

Fayetteville, W. Va., Feb. 19, 1917.

Sealed proposals will be received at the office of the Clerk of the County Court, Fayetteville, W. Va., until 2 P.M., April 2, 1917, for the improvement of the James River and Kanawha Turnpike in Sewell Mountain District of Fayette County. This work will be let in two sections, one beginning at a point on said Turnpike at the Greenbrier County line and extending in a generally northwesterly direction along the line of said Turnpike 7.8 miles to the intersection of the Corliss Road; the other extending from the intersection of the Corliss Road to the Nuttall District line, a distance of 6.4 miles.

Bids will be received for Bituminous Macadam, (penetration) Portland Cement Concrete, Asphaltic Concrete and other approved types of pavement.

Plans, profiles, estimates, et cetera, are on file in the office of T. F. Maloy, District Road Engineer, Landisburg, W. Va., from whom printed forms for bids, together with specifications and other data, may be secured upon application. Bids must be submitted on the prescribed printed form. Specifications and plans are also on file in the office of the Clerk of the County Court, Fayetteville, West Virginia, but not available for distribution.

A cash deposit of Five Dollars will be required for a set of plans and specifications for each section, the same to be refunded if bid is filed and the plans and specifications returned in good condition within thirty days from date of letting.

Proposals must be filed in the office of the Clerk of the County Court, Fayetteville, W. Va., addressed to the County Court of Fayette County and marked "Proposal for Improvement of the James River and Kanawha Turnpike." All work will be paid for in cash. A certified check for five (5%) per cent. of the proposal, made payable to the order of the Sheriff of Fayette County, shall be filed with each bid. The Court reserves the right to reject any or all bids.

T. F. MALOY,
District Road Engineer.

By order of the County Court of Fayette County, W. Va.

R. J. STEGALL, Clerk.
PHILIP KONRAD, President.

Bids received until Mar. 10, 1917.

Road Improvements

Port Murray, N. J.

Notice is hereby given that sealed bids will be received by the Township Committee of Mansfield Township, Warren County, N. J., for the improvement of the Hackettstown-Rockport Road, in the Township of Mansfield, in the County of Warren, with a slag surface; estimated amount of surface pavement required is 10,641 square yards; and opened and read in public at the Jr. O. U. A. M.'s Hall, at Port Murray, N. J., on Saturday, March 10th, 1917, at 10:30 A.M.

Drawings, specifications and forms of bid, contract and bond for the proposed work prepared by F. Westervelt Tooker, Engineer, and approved by the State Commissioner of Public Roads, have been filed in the office of said Commissioner at the State House, Trenton, N. J., and with Township Clerk, and may be inspected by prospective bidders during business hours. Bidders will be furnished with a copy of the specifications and blue prints of the drawing by the engineer on proper notice and payment of cost of preparation. Bids must be made on the standard proposal forms in manner designated therein and required by the specifications, must be enclosed in sealed envelopes, bearing the name and address of bidder on the outside, addressed to the Chairman of the Township Committee of Mansfield, in care of Samuel H. Perry, Township Clerk, Port Murray, N. J., and must be accompanied by a certified check or cash for not less than $400, and be delivered at the place and on the hour above named. The standard proposal form is attached to the specifications, copies of which will be furnished on application to engineer.

The Committee reserves the right to reject any and all bids.

By order of Chairman of Township Committee.

SAMUEL H. PERRY, Clerk.
Dated February 21st, 1917.

Bids received until Mar. 12, 1917.

Sanitary Sewers

Cuyahoga Falls, Ohio.

Sealed bids will be opened by the Clerk of the Village of Cuyahoga Falls, Ohio, at 12 o'clock noon, March 12, 1917, for the construction of about 5 miles of main and lateral sanitary sewers. Plans on file with or may be obtained from R. Winthrop Pratt, Consulting Engineer, Cleveland, Ohio, or from E. D. Barstow, Village Engineer, Cuyahoga Falls, upon deposit of $5.00, returnable upon return of plans. Printed bidding forms furnished by village.

The work will include the following approximate quantities:

Earth Excavation, 0 to 15 ft. deep, 12,000 cu.yds.
Rock Excavation, 0 to 28 ft. deep, 28,000 cu.yds.
Vitrified Pipe, 8-in. to 24-in., 24,600 lin.ft.
Cast-Iron Pipe, 8-in. to 12-in.....61 tons
Manholes 90
Concrete .....140 cu.yds.

Alternative bids will be taken on tunnel excavation in deep rock in lieu of open cut. The village reserves the right to reject any or all bids. Certified check, payable to Village Treasurer, for 10 per cent. of each bid required.

W. F. WILLISTON,
Village Clerk.

PROPOSAL FOR SALE OF DREDGE—Office U. S. Engineer, Newport, R. I.—Sealed proposals will be received here until 12 noon, March 13, 1917, and then opened, for sale of seagoing suction dredge "Gedney"; wooden hull, twin screw; length, 157 ft.; beam, 36½ ft.; depth, 16 ft. Vessel may be seen at Providence Gas Company's wharf, Providence, R. I. Full particulars on application.

Bids received until Mar. 7, 1917.

Proposals for 1100 ft. of Timber and Concrete Bulkhead on Delaware River, near Ferry Street

City of Trenton, N. J.

Pursuant to a resolution adopted February 14, 1917, the City Commission will receive at its meeting to be held on Wednesday, March 7, 1917, at 2:30 o'clock P.M., sealed proposals for the construction of 1100 feet of Timber and Concrete Bulkhead, on Delaware River, near Ferry Street.

The above work must be completed in twelve (12) months from date of commencement.

Plans and specifications with a draft of the contract and of the bonds required to be given may be seen at the office of Engineer of Streets and Public Improvements, on and after Wednesday, February 21, 1917.

Each proposal must be made on a blank form which will be furnished by the Engineer, and must be accompanied by a certified check to the amount of $500.00, conditioned that if the proposal be accepted the person or persons making it will execute the contract required to be executed and furnish the bond required to be furnished, within five days after the acceptance of the proposal.

The proposal must not be filed with any city official, but must be delivered by the bidder or his agent to the City Clerk, at the meeting above mentioned, when the same shall be called for by the President of the City Commission.

Said City Commission reserves the right to reject any or all proposals. Contract will be made subject to Chapter 253, laws of New Jersey, 1913.

LEON D. HIRSCH, City Clerk.
Dated February 16, 1917.

Bids received until Mar. 6, 1917.

Smoke Stacks

Asbury Park, N. J.

Proposals will be received by the Board of Commissioners of the City of Asbury Park, N. J., until 10 o'clock A.M., March 6th, 1917, for the erection of two steel or iron smoke stacks with all appendages necessary, as per specifications on file in the office of the City Clerk, copies of which may be obtained on application.

The Board of Commissioners reserves the right to reject any or all bids.

Proposals should be sealed and marked "Bids for stacks" and addressed to the undersigned.

HARRY B. WHITE, City Clerk.
Dated Feb. 20th, 1917.

PROPOSALS FOR BUILDINGS—U. S. Engineer Office, Buffalo, N. Y.—Sealed proposals will be received here until 11 A.M., March 15, 1917, and then opened, for constructing office-storehouse building and six operating houses at Black Rock Lock and storehouse at Ferry Street Bridge, Buffalo, N. Y. Further information on application.

U. S. ENGINEER OFFICE, Duluth, Minn.—Sealed proposals for dredging in Duluth-Superior harbor, Minn., and Wis., will be received at this office until 10 a.m., Mar. 19, 1917, and then publicly opened. Information on application.